

NATIONAL ENERGY CLIMATE-PLAN OF FRANCE

—
DRAFT UPDATE

October 2023

Table of contents

SECTION A: PLAN NATIONAL.....	5
1. Grandes lignes et procedure d'élaboration du plan	5
1.1. Résumé.....	5
1.1.1. Contexte et objectifs.....	5

1.1.2. Contexte politique, économique, environnemental et social lors de l'élaboration du plan	9
1.1.3. Stratégies et mesures clés relatives aux cinq dimensions de l'Union de l'énergie	10
1.2. Aperçu de l'état actuel des politiques publiques.....	18
1.2.1. Contexte du système énergétique et de la politique énergétique de l'Etat member et de l'Union pris en compte dans le plan national	18
1.2.2. Leçons tirées du PNIEC1.....	25
1.2.3. Consultations et implication des entités nationales et de l'Union et leurs résultats	25
1.2.4. Coopération régionale	30
1.2.5. Administration responsable de la mise en œuvre du PNIEC	37
1.2.6. Territorialisation du PNIEC.....	38
2. OBJECTIFS NATIONAUX ET CIBLES.....	38
2.1. Dimension « décarbonation »	39
2.1.1. Emissions et absorption de gaz à effet de serre	39
2.1.2. Energies bas-carbone	49
2.2. Dimension efficacité énergétique	70
2.2.1. Elements énoncés à l'article 4 de la directive 2013/1791/EU	70
2.2.2. Elements énoncés à l'article 8 de la directive 2013/1791/EU	71
2.2.3. Elements énoncés aux articles 5 et 6 de la directive 2013/1791/EU	72
2.3. Dimension « sécurité d'approvisionnement énergétique »	74
2.3.1. La sécurité d'approvisionnement en carburant.....	74
2.3.2. La sécurité d'approvisionnement en gaz	74
2.3.3. Sécurité d'approvisionnement en électricité.....	75
2.4. Dimension « marché intérieur de l'énergie »	78
2.4.1. Infrastructures énergétiques	78
2.4.2. Marché de l'énergie	80
2.4.3. Précarité énergétique	81
2.5. Stratégie française en matière de recherche d'innovation, déploiement des nouvelles technologies et compétitivité	84
2.5.1. Enjeux industriels et de compétitivité du système énergétique	84
2.5.2. Les stratégies françaises d'investissement dans les technologies bas-carbone.....	86
3. POLITIQUES ET MESURES	87
3.1. Dimension « decarbonation ».....	92
3.1.1. Emissions et absorption de gaz à effet de serre	92
3.1.2. Energies bas-carbone	120
3.1.3. Autres éléments de la dimension decarbonisation.....	128

3.1.4.	Politiques et mesures visant à atteindre les autres objectifs nationaux, le cas échéant	129
3.1.5.	Politiques et mesures en faveur de la mobilité à faibles émissions de carbone (y compris l'électrification des transports)	130
3.1.6.	Lorsqu'applicable, politiques nationales, calendriers et mesures planifiées pour mettre fin aux subventions énergétiques, en particulier pour les énergies fossiles	144
3.2.	Dimension « efficacité énergétique »	145
3.2.1.	Mécanisme national d'obligations en matière d'efficacité énergétique et mesures de politique publique alternatives conformément aux articles 7 bis et 7 ter de la directive 2012/27/UE, à préparer conformément à l'annexe II	145
3.2.2.	Stratégie de rénovation à long terme visant à soutenir la rénovation du parc national de bâtiments résidentiels et non résidentiels, tant publics que privés (4), y compris les politiques, mesures et actions destinées à encourager les rénovations profondes rentables et les politiques et actions visant à cibler les segments les moins performants du parc immobilier national, conformément à l'article 2 bis de la directive 2010/31/UE.	148
3.3.	Dimension « sécurité d'approvisionnement énergétique »	153
3.3.1.	La sécurité d'approvisionnement en carburant	154
3.3.2.	La sécurité d'approvisionnement en gaz	155
3.3.3.	Sécurité d'approvisionnement en électricité	156
3.4.	Dimension « marché intérieur de l'énergie »	157
3.4.1.	Infrastructures énergétiques	157
3.4.2.	Marché de l'énergie	158
3.4.3.	Précarité énergétique	159
3.5.	Stratégie française en matière de recherche d'innovation, déploiement des nouvelles technologies et compétitivité	159
3.5.1.	Enjeux industriels et de compétitivité du système énergétique	159
3.5.2.	Les stratégies françaises d'investissement dans les technologies bas-carbone	160
SECTION B: BASE ANALYTIQUE		166
4.	SITUATION ACTUELLE ET PROJECTIONS AVEC LES POLITIQUES ET MESURES EXISTANTES	166
4.1.	Evolution projetée des principaux facteurs exogènes	166
4.1.1.	Prévisions macroéconomiques (PIB et évolution de la population)	166
4.2.	Dimension « décarbonation »	167
4.2.1.	Emissions et absorption de gaz à effet de serre	167
4.2.1.2.	Projections des émissions sectorielles avec les politiques et mesures nationales et de l'Union existantes au moins jusqu'en 2040 (y compris pour l'année 2030)	170
4.2.2.	Energies bas carbone	175
4.3.	Dimension « efficacité énergétique »	176
4.4.	Dimension « sécurité énergétique »	180

4.4.1. Sécurité d’approvisionnement en électricité	180
4.5. Dimension « marché intérieur de l’énergie »	182
4.5.1. Infrastructures énergétiques	182
4.5.2. Marché de l’énergie	182
4.5.3. Précarité énergétique	182
4.6. Stratégie française en matière de recherche d’innovation, déploiement des nouvelles technologies et compétitivité	182
5. EVALUATION DE L’IMPACT DES POLITIQUES ET MESURES PLANIFIEES	184
5.1. Impacts des politiques et mesures détaillées dans la section 3	184
5.1.1. Projections de l’évolution du système énergétique et des émissions et absorptions de GES ainsi que, le cas échéant, des émissions de polluants atmosphériques conformément à la directive (UE) 2016/2284 dans le cadre des politiques et mesures prévues au moins jusqu’à dix ans après la période couverte par le plan (y compris pour la dernière année de la période couverte par le plan), y compris les politiques et mesures pertinentes de l’Union.	184
5.1.1.1. Synthèse du scénario et des projections AMS par secteur.....	185
5.1.1.2. Trajectoire de réduction des émissions du scénario AMS par secteur et respect des objectifs 2030 et 2050	209
5.1.2. Évaluation des interactions entre les politiques et mesures existantes et les politiques et mesures prévues, et entre ces politiques et mesures et les mesures de la politique de l’Union en matière de climat et d’énergie	213
5.2. Impacts macro-économiques, sur la santé, l’environnement, l’emploi, la formation, les compétences et sociaux.....	214
5.2.1. Impacts macro-économiques.....	214
5.2.2. Impacts sociaux.....	215
5.2.3. Impacts environnementaux	217
5.3. Aperçu des besoins en investissements.....	218

SECTION A: NATIONAL PLAN

1. Outline and procedure for drawing up the plan

1.1. Summary

1.1.1. Background and objectives

This draft update of France's integrated national energy and climate plan is based on two national programming and governance documents on energy and climate, which are currently under revision and will be subject to public consultation in the coming days:

- the multiannual energy programming (EPP), which sets out the priorities for government 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 pillars of energy policy: controlling 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 to decarbonise the French energy mix and to strengthen the country's energy sovereignty through the exit from 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 net zero carbon neutrality by 2050.

EPP and SNBC are closely linked: the EPP energy scenario is the same as that of SNBC for the period it covers. Thus, in terms of energy consumption and energy mix, the EPP covers the first ten years of SNBC. In the EPP, these ten years have an operational goal for state action to decarbonise energy: for example, it foresees 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 climate objectives. SNBC also addresses all other greenhouse gases that are not dealt with under the EPP framework.

The work on the future SNBC ('SNBC 3') is the result of the work carried out by the Prime Minister on environmental planning. These two exercises are closely linked: the **preparatory work of SNBC 3 feeds into¹ and is fed in return by the mitigation component of the government's work on environmental planning:**

- The preparatory work for SNBC 3, and in particular the first modelling exercise (run 1) carried out by the Ministry of Energy Transition in this context, fed into the first version of the **action plan for a successful green transition** published in summer 2023².

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

² This overall plan identifies all the additional levers to be mobilised to achieve our environmental objectives (mitigation, adaptation, biodiversity, resources, health-environment). It can be found at the following link:

<https://www.gouvernement.fr/upload/media/content/0001/07/dc29785bc6c40139f4b49ee2ac75c2a154856323.pdf>

- On this basis, the work carried out in the context of ecological planning has made it possible to **set first (provisional) sectoral targets** for reducing greenhouse gas emissions by 2030 and to **clarify the levers envisaged**. More than 50 levers of actions have been identified and quantified to achieve the green transition and propose to everyone – whether citizens, local authorities, businesses or associations – concrete solutions to reduce their greenhouse gas emissions, and financial means to support French people.
- These elements have, in return, been taken into account in the latest modelling exercise (run 2) conducted by the Ministry of Energy Transition (second iteration). So far, the results achieved by 2030 by sector through the modelling exercise (which appear on the graphs in this document) may differ from the ‘sectoral targets’ defined in the green planning work by some Mt CO₂eq (with the exception of the LULUCF sector, where the gap is larger).
- This illustrates that **modelling and target setting consistently across different time horizons and in a close way between energy carriers is an iterative and continuously improving process**.

The final scenario, chosen by the government and which will base the SNBC 3 by 2050, will have to meet the final sectoral targets set by the government. In summary, the green planning methodology adopted by the government consists of readjustment of the trajectories and levers of action along the way, in order to ensure the achievement of the objectives by identifying additional measures to compensate for the risk areas identified in the modelling. The roadmaps will therefore continue, until the adoption of the SNBC and even thereafter, to be reassessed on the basis of new knowledge on each of the levers in order to achieve a trajectory in line with the achievement in 2030 of -50 % gross and -55 % net emissions, and with carbon neutrality by 2050.

In order to embed citizens and businesses in the necessary transformation effort, the Government stresses the co-benefits of the green transition. This is why priority will systematically be given to means of reducing emissions, which have a positive impact on local jobs, improve French people's lives and health, or which make it possible to resolve financial equations that are sometimes difficult for households or to increase the competitiveness of businesses through the exit from fossil fuels. In terms of energy closure, the EPP is also based on a search for energy self-sufficiency for electricity and greater independence on other alternative gas and oil carriers, as coal already represents only a residual contribution to our energy mix, making it possible to ensure a positive contribution from France to European security of supply.

In terms of geographical scope, the EPP covers only mainland France while SNBC also covers Corsica and the overseas departments. The elements included in the INECP may therefore show slight deviations in the perimeter of this.

The principle of drafting these two documents was introduced by the Law on Energy Transition for Green Growth (LTECV) of 17 August 2015. The national low-carbon strategy and carbon budgets in force (SNBC 2) were adopted by decree on 21 April 2020 (Decree No 2020-457). The multiannual energy programming for the period 2018-2028 was adopted by decree on 21 April 2020 (Decree No 2020-456). EPP and SNBC are united by a link of compatibility: LTECV states that the EPP must be compatible with the SNBC and the greenhouse gas emission reduction targets set in the carbon budgets.

The LTECV provides for the revision of these two documents every five years. **The EPP and SNBC are currently undergoing a full review cycle that started in 2021 and continues.** A document presenting

the main orientations of the EPP 3 and a second document presenting the first broad orientations of SNBC 3 until 2030 will shortly be put into public consultation.

Prior to their adoption by decree, the SNBC and EPP projects will be subject to regulatory consultations with stakeholders and the public, in line 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 the committees responsible for energy, the High Council for Climate Affairs, the Assembly of Corsica, overseas authorities, the National Council for Assessment of Standards, the regulatory role of the General Secretariat of the Government and the public.

This draft integrated national energy and climate plan for France is based on ecological planning, where several citizens' consultations have been 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 above-mentioned SNBC 3 and EPP 3, 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 targets. The table below summarises these main objectives and guidelines and compares them, where they exist, with European objectives.

	Objective	Horizon	Forecast
Final energy consumption	National target of 30 % in 2030 compared to 2012 EU target of 30 % compared to 2012	2030	1 209 TWh or 104,1 Mtoe
Primary energy consumption	Achieve a primary energy consumption of 157,3 Mtoe (or 1 830 TWh)	2030	1 830 TWh or 157,3 Mtoe
Primary energy consumption for energy use – Charge	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 – 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 in 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 in 2035
Share of renewable energy consumption in gross final energy consumption	58 % decarbonised energy in the energy mix in 2030 and 71 % in 2035	2030 and 2035	Renewable targets by sector: In 2030: PV: 54 to 60 GW Terrestrial link: 33 to 35 GW

			Eolien at sea: 3.6 GW Hydropower (including STEP): 26.3 GW Renewable heat 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
Nuclear production capacity	9,9 GWe of new capacities committed by 2026	2026	9.9 GW of new committed capacity
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	Injection into the gas network of 15 % renewable gases in 2030	2030	44 TWh/year
Installed flexibility capacity	Objective of developing flexibilities	2030 and 2035	25 GW in 2030 and 35 GW in 2035.
GHG emissions excluding LULUCF	Reduction of greenhouse gas emissions by -50 % in 2030 compared to 1990	2030	272 MT CO ₂ eq in 2030 or - 50 % compared to 1990
GHG emissions	Achieving carbon neutrality in 2050 (including international bunkers)	2050	Objective not assessed at this stage
ESR Regulation – objective France	Reduction of greenhouse gas emissions by -47.5 % in 2030 compared to 2005	2030	215 MT (compliance with the trajectory with a slight surplus at the end of the period)
Land use, land use change and forestry (LULUCF) sector – target France	LULUCF (agriculture + forest) sink gain of 7 MtCO ₂ between the average of the years 2016 to 2018 (-23 MtCO ₂) to 2030	2030	The well in 2030 is currently projected at -18 MtCO ₂ , while it is expected to reach -30 MtCO ₂ . This would result in a shortfall of 12 MtCO ₂ compared to our targets, albeit with high uncertainty about these projections.

Table 1: Summary of the main orientations of the French energy and climate strategy

The measures presented will have to be complemented by additional measures to achieve all the objectives by 2030, in particular to translate into French law texts adopted recently or in the process of being adopted at European level.

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 or mobilised new schemes to protect consumers. These mechanisms, which are consistent with European law, both Directive 2019/944/EC and the 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, particularly the most vulnerable, and businesses.

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

- Reference tariff set at its level in November 2021, then limiting the increase to 15 % in 2023, State aid to reduce the price of market offers to an equivalent price, aid to households for collective heating using natural gas;
- Limiting the increase of regulated electricity sales tariffs in February 2022, then limiting the increase to 15 % in February 2023 and to an additional 10 % in August 2023, lowering the electricity excise duty to its minimum permitted level, support for collective housing;
- Rebate on fuel in 2022, followed by a targeted fuel allowance in 2023.

During the winter truce, between¹ November and 31 March, energy suppliers are under an obligation to maintain the supply of natural gas and electricity to their unpaid customers. However, electrical power can be reduced, except for the most vulnerable households, defined as those eligible for the energy voucher. Apart from the winter truce, if an interruption of supply is envisaged, its implementation is subject to strict rules for all households (relaunch letters, deadlines, information to the social services by the supplier where the feed has not been restored within five days of the outage).

In addition, since 1^{April} 2023, a minimum 60-day electricity supply period has been put in place for beneficiaries of the energy voucher and the housing solidarity fund, prior to any cuts in the event of unpaid payments, including outside the winter truce. During this period, the electricity supply is maintained at 1 kVA, allowing the consumer and the supplier time to find a solution to the household situation.

In addition to these preventive measures, France also has curative measures to help low-income households pay their energy bills. The energy voucher, which was generalised in 2018, is state aid to modest households to help them pay their energy bills, regardless of the heating mode (electricity, gas, wood, fuel oil, LPG, etc.) or energy renovation works. State aid allocated to households' energy expenditure is the tool to mitigate 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 people living under the same roof), it is granted according to 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 allocated to the lowest 40 % of households between the end of 2022 and early 2023 to help them cope with bill increases.

The arrangements for developing the energy voucher after the abolition of the housing tax are currently being studied, in order to safeguard the protection afforded by the scheme and its

advantages in relation to other approaches (free choice of supplier, neutrality between energy sources, incentives to control consumption). Improvements to the scheme may also be explored as part of this reform, in particular to make the system even more accessible and easy to use for the most vulnerable households.

1.1.3. Key strategies and measures for the five dimensions of the Energy Union

In general, the presentation according to dimensions and sectors should not overlook the fact 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 a very substantial improvement in energy efficiency. In other cases, attention should be paid to potential adverse effects (e.g. impact of wood energy development on air quality). The ongoing work on the scenario underpinning the EPP and SNBC provides an opportunity to have a holistic and cross-cutting view on the different dimensions and sectors.

1.1.3.1. The decarbonisation dimension

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 for pursuing its climate change mitigation policy and meeting its short-, medium- and long-term greenhouse gas (GHG) emission reduction targets. It is one of the two strands of French climate policy, alongside the National Plan for Adaptation to Climate Change.

The Euromed Trade Roadmap until 2010 and beyond includes in particular:

- **A long-term objective** (achieving carbon neutrality in 2050. Carbon neutrality is a balance between greenhouse gas emissions and removals);
- **A target trajectory to achieve this** (based on a forward-looking scenario, a credible pathway towards the objective of identifying technological localities and anticipating innovation needs);
- **carbon budgets** (i.e. GHG emission ceilings not to be exceeded expressed as an annual average over a period of 5 years in million tonnes of CO₂ equivalent. They are broken down by sectors of activity and by greenhouse gases);
- **public policy guidelines** to achieve these objectives (sectoral, governance and transversal guidelines) **and monitoring indicators**.

The SNBC in force is SNBC 2, adopted by decree in April 2020. The law provides for the revision of the SNBC every five years. The preparation of SNBC 3 is the subject of ongoing work.

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

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

- by major sectors (ETS emissions, ESR emissions, and since 2019: negative emissions linked to Land Use, Change in Land Effect and Forestry)
- by main areas of activity (transport, residential and tertiary buildings, industry, agriculture, energy production and waste)
- and indicatively in annual instalments per greenhouse gas.

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 considered, including sectoral variations. This comparison shows in particular the recent impact of past measures.

The carbon budgets in force cover the periods 2019-2023, 2024-2028 and 2029-2033. They were adopted when SNBC 2 was adopted in line with the French climate ambition at that time to reduce France's gross greenhouse gas emissions by at least 40 % in 2030 compared to 1990 and to achieve carbon neutrality in 2050 (see 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 package.

Average annual emissions (in Mt CO ₂ eq)	Reference years ³			2th carbon budget	3th carbon budget	4th carbon budget
Period	1990	2005	2015	2019-2023	2024-2028	2029-2033
Total (excluding LULUCF)	546	553	458	422	359	300
Total (with LULUCF)	521	505	417	383	320	258
Of which ETS sector (excluding international and domestic aviation)			100	97	80	66
of which ESR sector			353	321	274	229
of which domestic aviation			5	5	5	4
of which LULUCF	— 26	— 48	— 41	— 39	— 38	— 42

Table 2: Carbon budgets fixed by Decree No 2020-457 of 21 April 2020

The carbon **budget for the period 2019-2023 in gross terms (422 Mt CO₂ eq/year on average) is on track to be respected. The final balance of this carbon budget will be drawn up in 2025 on the basis of the consolidated data from the CITEPA National GHG Emission Inventory for the year 2023.**

France is also currently working **on the revision of its SNBC**. 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

The historical greenhouse gas³ emissions taken into account come from the national inventory available in 2018, at the time of the main work on the EPP-SNBC joint scenario. Some figures are therefore likely to have been updated by more recent inventories. A technical adjustment to these carbon budgets will be established, in accordance with the Environment Code (Article D. 222-1 B), in the event of changes in accounting for greenhouse gas emissions leading to a correction of more than 1 % of emissions for the reference years specified by decree, at the time of the carbon budget balance (at closure), that is to say in 2025 (on the basis of consolidated CITEPA data for 2023) for the 2019-2023 carbon budget.

2030 and ^{the} **5th carbon budget** (2034-2038). They will be fixed by decree when SNBC 3 is adopted. A first provisional estimate of the 3th^{and} 4th carbon^{budgets} can be found in the rest of the document.

The orientations of the national low-carbon strategy

The **current SNBC** (SNBC 2) provides 45 public policy orientations, both cross-cutting and sectoral, to implement the transition to a low-carbon economy and achieve carbon neutrality in 2050.

The draft **first broad guidelines for the SNBC 3 project** are set out in detail in the remainder of this document. They will be refined and may be amended by the final update of the PNIEC.

Planned policies and measures for the decarbonisation dimension

As emissions from the combustion of energy account for 70 % of France's greenhouse gas emissions, decarbonisation of energy is essential to achieve the emission reduction targets. This is done through four pillars: energy sobriety, energy efficiency, acceleration of all renewable energies and the revival of nuclear power. The EPP defines state action over the next decade 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, extension of product lifespan), better waste management (optimisation of waste sorting, development of recycling and recovery) and involving all stakeholders.

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, in particular the National Strategic Plan 2023-2027, the national plant protein strategy, the Bio ambition programme and the plan to teach 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. France also advocates strengthening the environmental ambition of the Common Agricultural Policy (CAP). In addition to changes in agricultural practices, the 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 the regulation of the minimum share of local agricultural products or quality labels served in mass catering by 2022, and the introduction of pre-diagnostic tests for combating food waste which are compulsory for all catering operators.

With regard to the land use, land use change and forestry (LULUCF) sector, the policies and measures to ensure compliance with Regulation (EU) 2018/841 are based in particular on the agri-ecological project for France, on the one hand, and the revitalisation of forest management on the other hand, but also in the longer term of a French forest adaptation strategy. In particular, as regards the forest-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 with bio-based products
- energy recovery of bio-based products or waste from such products which replace fossil fuels;

Several national strategies and plans aim at activating these different levers, including the National Bioeconomy Strategy, the National Forest and Timber Programme, the National Biomass Mobilisation Strategy, and the Strategic Timber Sector Contract.

These strategies have been strengthened by means of public aid in the sectors concerned through various calls for projects under the Recovery Plan or France2030, in particular forestry renewal, the constructive Bois System (SCB) and Biomasse Chauffage for the Wood Industry (BCIB). They are also supported by certain elements of EU law, in particular the sustainability requirements for bioenergy defined by RED II.

Main orientations of SNBC 3

The process of preparing the future SNBC 3 is part of a particular context and there are many issues at stake in its development. In particular, the future SNBC will have to:

- **Translating Europe's climate ambition forward for France.** The new European milestone 2030 could imply an **overall reduction in France's greenhouse gas (GHG) emissions in 2030 of at least 50 % gross compared to 1990** (compared to the current target of -40 %) **and in the order of -55 % net** (including the land and forest sector).
- These new targets will have to translate into an unprecedented acceleration of our climate action. France will now have to reduce its greenhouse gas emissions by 5 % each year between 2022 and 2030, compared with an average annual reduction of 2 % from 2017 to 2022. This acceleration will require efforts by all and transformation in all sectors emitting GHG in our economy by 2030. SNBC 3 will set the carbon budgets for 2024-2028, 2029-2033 and 2034-2038 in line with this new ambition and indicative carbon budgets for the carbon footprint and international bunkers.
- **Strengthen the link between national climate objectives and territorial planning** to ensure consistency of action at the various levels.
- **Ensure that appropriate accompanying measures are in place**, in particular for households and businesses.

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

This ambition is supported by the government as part of this foresight modelling work. The aim of this work is to build the sectoral greenhouse gas emission trajectories underpinning the SNBC⁴ through the identification of new measures, public policies and the needs to be put in place or accompanying in order to achieve our objectives (financing, jobs and skills, etc.) **(see details in Section 5 of this INECP)**. One major challenge of this prospective modelling exercise is **to ensure, in the final version of the SNBC baseline, the 'closing' of all our trajectories**, i.e. ensuring that all sectors (transport, agriculture, buildings, industry, energy, waste) **match needs with resources** (quantity of energy, quantity and nature – solid, liquid, gaseous – biomass, industrial capacity and availability of skills, financial resources, etc.) at each time horizon, and to **recognise the role that each actor** (elected representative, economic actor, citizen) will play in **providing solutions**.

⁴ The modelling work allows two scenarios to be prepared: scenario "with existing measures" (AME) and "with additional measures" scenario (AMS)). The AME scenario is a trend scenario that aims to give a point of comparison ("all other things being equal"). The AMS scenario is the baseline scenario to achieve our targets.

The role of this scenario will be strengthened in the future SNBC and the sub-sectoral trajectories and the evolution of the different categories of levers most influential (level of consumption, energy efficiency, unit emissions, etc.) to achieve the 2030 target will be explained. The aim is to make it easier for actors to stand in relation to the scenario and to facilitate the debate on the compatibility of public policy measures or sectoral plans with the SNBC.

Achievement of decarbonisation objectives

The preparation of the future SNBC and EPP relies on **extensive modelling work**. In this context, the Ministry for Energy Transition (the Directorate-General for Energy and Climate) is building an energy and climate scenario to describe a **target trajectory for reducing greenhouse gas emissions up to the objectives set for 2030 and until carbon neutrality in 2050** ('with additional measures' or AMS). This work is not a forecasting exercise but rather a planning exercise: the aim is for the State to set out, among the various possible trajectories, a scenario based on a set of measures and assumptions.

The aim of this scenario is to **establish the carbon budgets (global and sectoral)**, to **determine the roadmap to be followed by sector** in order to achieve France's climate and energy objectives and to **serve as a reference for other planning documents**, whether produced by the State, local authorities or even companies.

This **work is ongoing at national level** with the aim of establishing a robust and shared baseline for the future SNBC 3 and EPP 3. This work is **iterative**. It started in 2021 and **will continue until the adoption of the future SNBC 3 and EPP 3**. The assumptions, trajectories and targets presented in this document are derived from the **second iteration of the scenario exercise**. **They are not final**. These **elements stem from the extensive work of consultation and dialogue** with stakeholders, including citizens and economic actors **since October 2021**.

France's objectives are:

- — **50 % gross greenhouse gas emissions in 2030 compared to 1990**
- — **55 % net greenhouse gas emissions in 2030 compared to 1990**

In a context where forests are already severely affected by the impacts of global warming, with the impacts of climate change accelerating and amplifying the impacts of climate change compared to what was anticipated in previous studies, the new estimates of changes in the forest sink show a risk of a natural carbon sink deficit.

It is with this in mind that the government will continue and scale up its action, through a balanced approach to the various forest-related challenges, to preserve the carbon sink: massive support for the forest-based sector under the France Relance and France 2030 plans (in particular through the calls for forestry 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, needed to produce more carbon-sequestering biomaterials), incentives for afforestation, strengthening the means of preventing and combating fires, etc. In addition to these measures, the Government will work towards achieving the French and European objective of reducing net GHG emissions through additional measures to reduce greenhouse gas emissions. Ecological planning is an iterative process of continuously adjusting the roadmap to identify additional levers to compensate identified risk areas through modelling and new analyses and knowledge. These initial results will therefore be taken into account in the preparation of the final SNBC 3 in order to achieve the gross and net targets.

Modelling shows that all the measures planned or planned by the Government make it possible to achieve

— 50 % gross greenhouse gas emissions in 2030 compared to 1990, at 272 Mt.

The graph below shows the results of the draft baseline scenario, sector by sector (excluding carbon sinks).

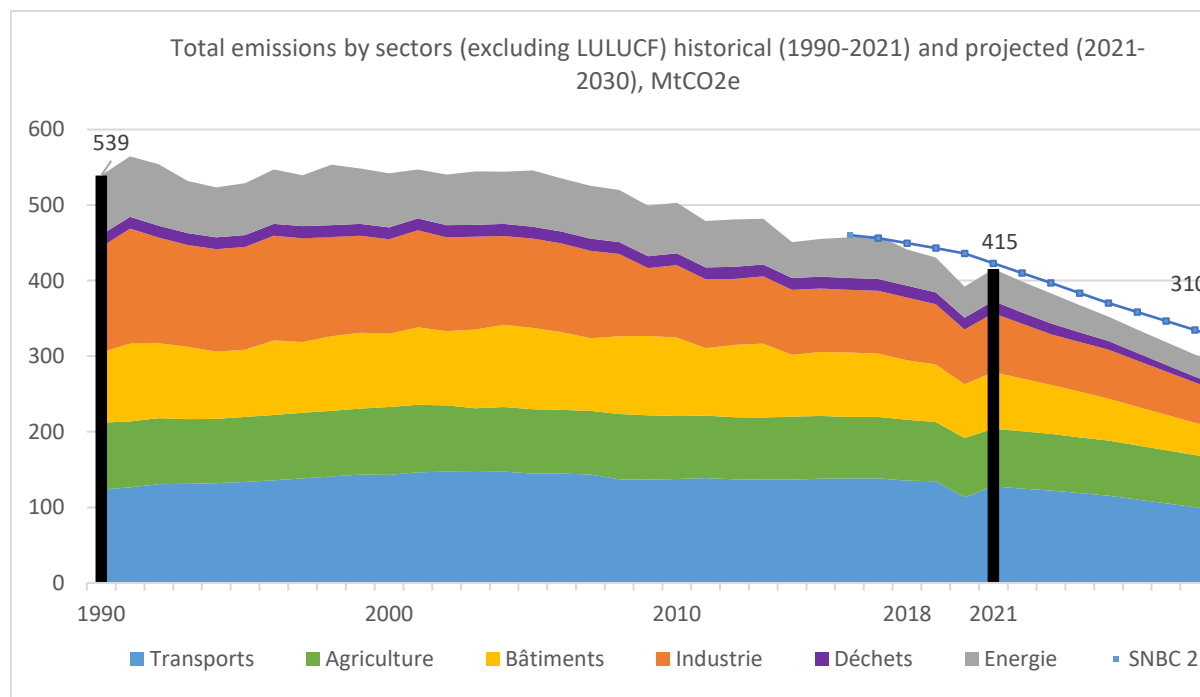


Figure 1: Changes in territorial greenhouse gas emissions (Sources: national greenhouse gas emission inventory, DGEC modelling)

1.1.3.2. The energy dimension

EPP stocktaking 2

In 2022, final energy consumption excluding international bunkers reached 1 500 TWh, representing a decrease of 7 % compared to 2018. The French strategy is based on accelerating efforts in terms of energy efficiency and energy efficiency.

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 was increased to 20.7 % in 2022, showing a net acceleration compared to 2021 (+ 1.3 %), and putting France at a level comparable to our main European partners (Germany, Spain and Italy).

Finally, almost 670 000 homes could be renovated thanks to MaPrimeRénov' aid in 2022. The electric passenger vehicle fleet (including plug-in hybrids) now stands at 1,1 million with more than 100 000 publicly accessible recharging points by mid-2023.

EPP Broad Guidelines 3

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

Three building blocks of the French energy strategy:

1. **Reducing our energy consumption** through sobriety and energy efficiency
2. **Producing in France the electricity we need** to meet our consumption: nuclear revival and acceleration of renewable energy
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 trajectories are set for the **exit of fossil fuels**. The remaining coal-fired power plants will be closed or converted to decarbonised solutions by 2027, with a strong decline in coal, gas and oil consumption, aiming at fossil energy consumption divided by 2 in 2030 and 3 in 2035 compared to 2012.

Guidelines are laid down, sector by sector (buildings, industry, transport and agriculture), in order to meet the targets **for reducing our energy consumption** which have been reinforced at European level, namely the objective 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, the increase in the development of photovoltaic electricity (a 2-fold increase in the annual rate of development of new photovoltaic capacities) and offshore wind (increasing the rate of offshore wind capacity allocation), the development of bioenergy and renewable heat (more than twice the amount of renewable heat and recovery by 2035; increasing the proportion of biogas injected into networks to 15 %, raising the hydrogen deployment targets to 6.5 GW of production capacity in 2030, supporting the installation of biofuel production capacity on national territory) and **relaunching the nuclear sector** (including continued operation of all reactors as long as safety allows, construction of 6 EPR2 and study for 13 GW of new nuclear capacities, programme of innovation in new reactors and strengthening of the fuel cycle).

Particular emphasis is placed on **adapting energy networks and security of supply** in order to meet the growing demand for electricity and the quantitative and qualitative evolution of consumption of gas and petroleum products. The French strategy will thus ensure better anticipation of the necessary developments in the electricity grid in order to adapt to the acceleration of the development of renewable electricity projects, provide for the connection of very powerful units such as offshore wind farms and future nuclear reactors EPR2, while ensuring the supply of new charging stations for electric vehicles, electrolyzers for hydrogen production and electrification of new, highly energy-intensive uses. It will also organise the evolution of the gas and oil networks to enable the transmission of developing energy carriers (biogas, hydrogen) and the adaptation of infrastructure to lower 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, and supporting the structuring of industrial sectors.

This planning ensures that the **challenges of ‘closing’** are fully taken into account, i.e. it ensures sufficient availability of energy resources to meet needs (such as biomass or electricity), but also economic ‘closures’ and the availability of the skills needed for the transition.

Finally, two key conditions are embedded in our energy strategy: to ensure its success, the **mobilisation of the regions** for implementation and practical implementation on the ground; to ensure its credibility, **environmental protection and the efficient and sustainable management of resources and space** are taken into account.

1.1.3.3. Taking into account 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 perceived as a form of injustice (job loss, insecurity, rising energy prices, etc.), they will 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 and subsidy for the smallest households**.

To feed into the reflections on these aspects, **the SNBC 3 will be the subject of a macroeconomic evaluation**. This assessment, carried out by comparing the baseline scenario supported by the government to the trend scenario with the current measures, **will provide valuable elements in terms of the social and economic impact of the assumptions and orientations 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” by⁵Jean Pisani-Ferry and Selma Mahfouz on the economic impact of the transition.

These elements will be refined in the final version of the update of the PNIEC.

1.2. Overview of the state of play of public policies

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

Following the increase in the European target of reducing greenhouse gas emissions from -40 % gross to -55 % net in 2030 compared with 1990, **France has set itself to:**

- the objective of a **‘gross’ reduction** (excluding the land sector) in GHG emissions of **at least 50 % compared to 1990** (up from -40 % so far).
- the target of a **net reduction** (including the land sector) of GHG emissions **of around -55 % compared to 1990**.

In addition, **France plans to strengthen the objective of carbon neutrality in 2050** by including now France’s emissions from international aviation and maritime transport (reported out of total in the national GHG inventory).

These objectives structure the work on the future SNBC.

France’s primary energy consumption stood at 2 482 TWh in 2022 (in real data not corrected for climate change). France’s real primary energy mix consists of 37 % nuclear, 30 % oil, 16 % natural gas, 15 % renewable energy and waste (1 % of which are non-renewable waste) and 3 % coal. Wood

⁵ <https://www.strategie.gouv.fr/publications/incidences-economiques-de-laction-climat>

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.

TOTAL : 2 482 TWh en 2022 (donnée non corrigée des variations climatiques)
En % (données non corrigées des variations climatiques)

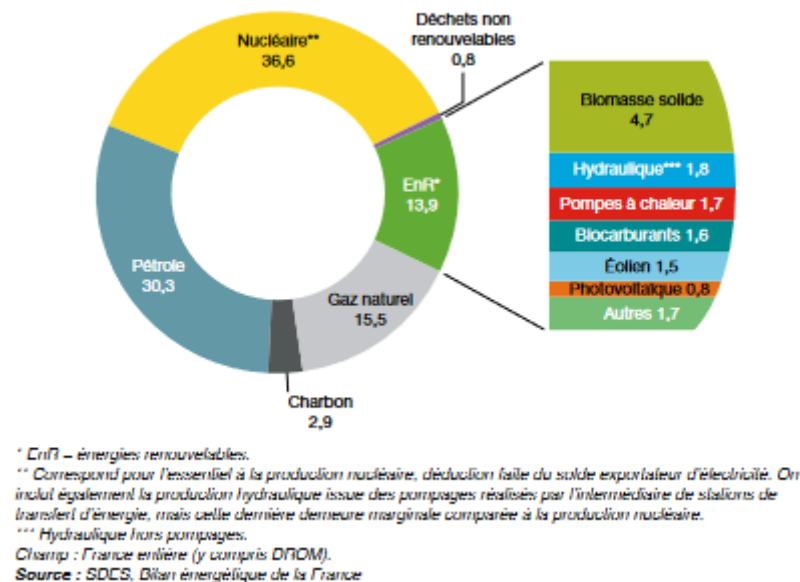


Figure 2: Distribution of primary energy consumption in 2022 (%)

Final energy consumption, corrected for climatic variations, amounted to 1 532 TWh in 2022. The year 2022, marked by the energy crisis, fell from 1.6 % in 2021, mainly due to changes in consumption in industry (9.6 %) and, to a lesser extent, residential (2.6 %) and Farmers and Fisheries (8.2 %). Conversely, consumption increases in transport (+ 4 %) and the tertiary sector (+ 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 12 % drop in gas and electricity consumption between August 2022 and July 2023.

After almost continuous growth between 1990 and 2001, final energy consumption then declined (0.6 % on annual average between 2011 and 2022, to corrected climate). From 1990 to 2021, the share of service in consumption increased from 13 % to 16 %, while the share of industry decreased from 24 % to 19 %. The share of transport increased slightly (from 30 to 33 %) and 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 of 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.

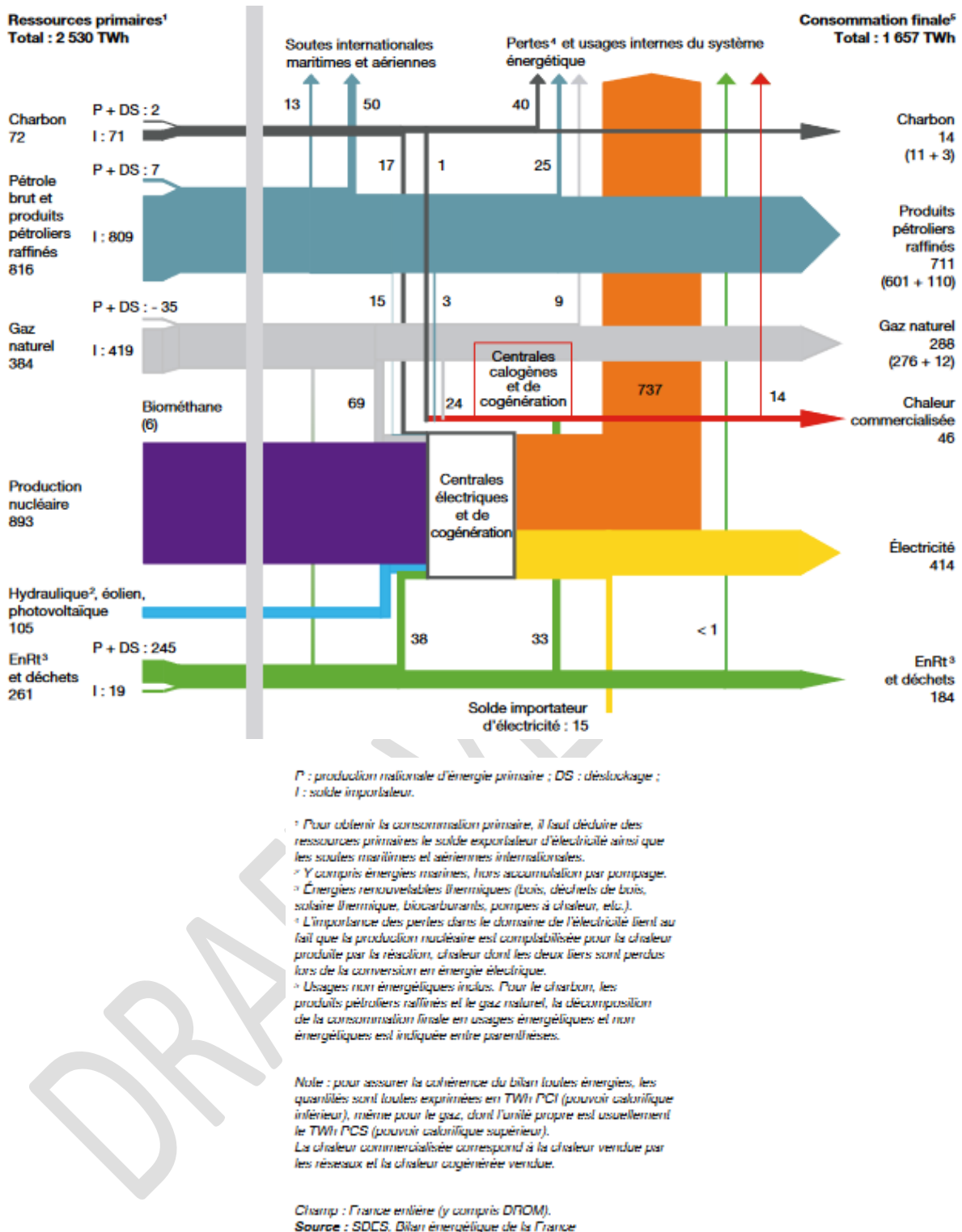


Figure 3: Energy balance of metropolitan France in 2022 (TWh) – Source: SDES

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

In buildings, energy sources are much more diverse than in transport. Electricity has the largest share, followed by gas, then oil and wood for heating.

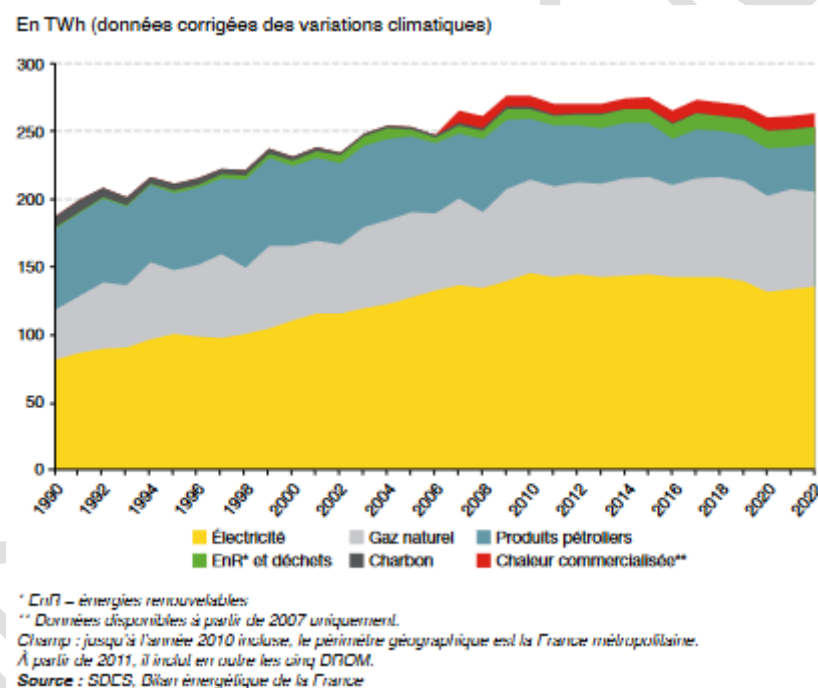
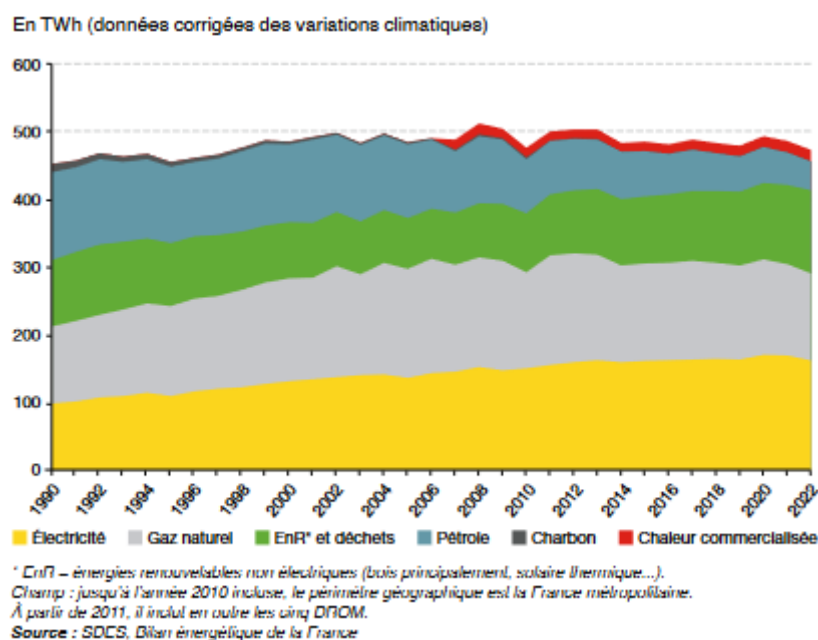


Figure 4: Final energy consumption in residential and tertiary sectors in 2022 (TWh) – Source: SDES

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

The share of coal in French industry consumption has decreased significantly in 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 energy as well.

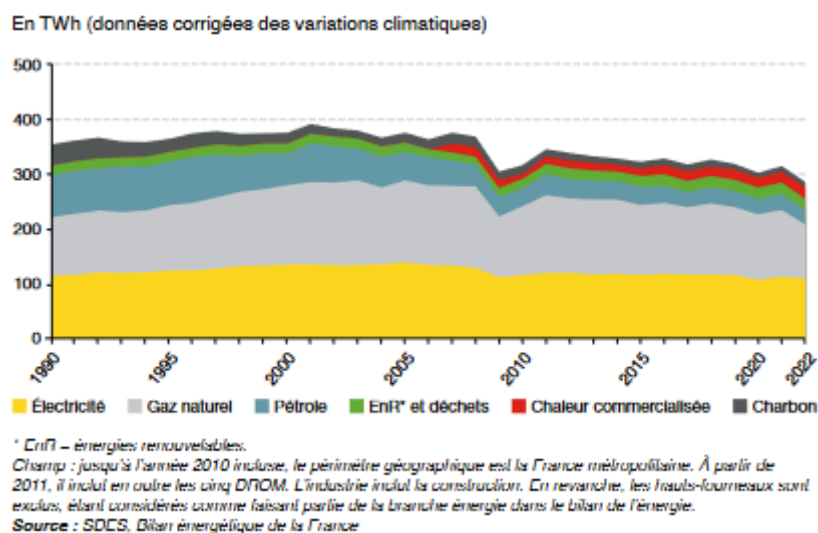


Figure 5: Final energy consumption in industry in 2022 (TWh) – Source: SDES

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

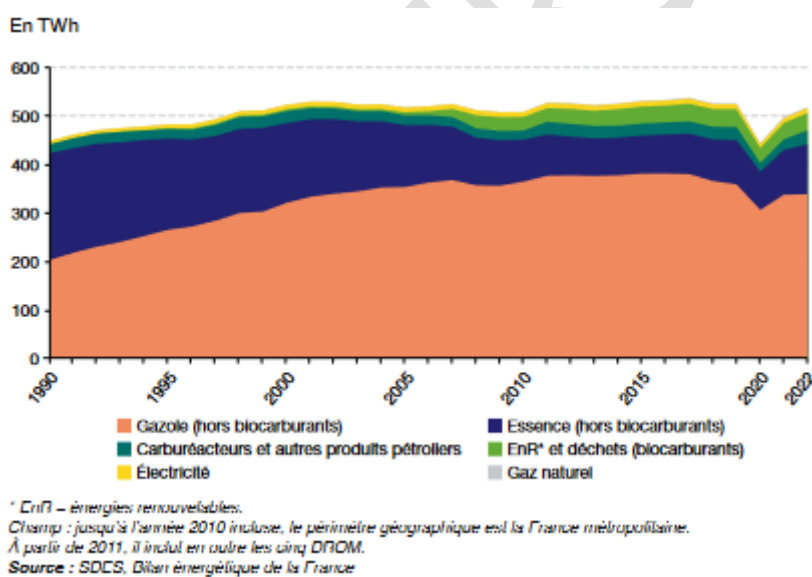
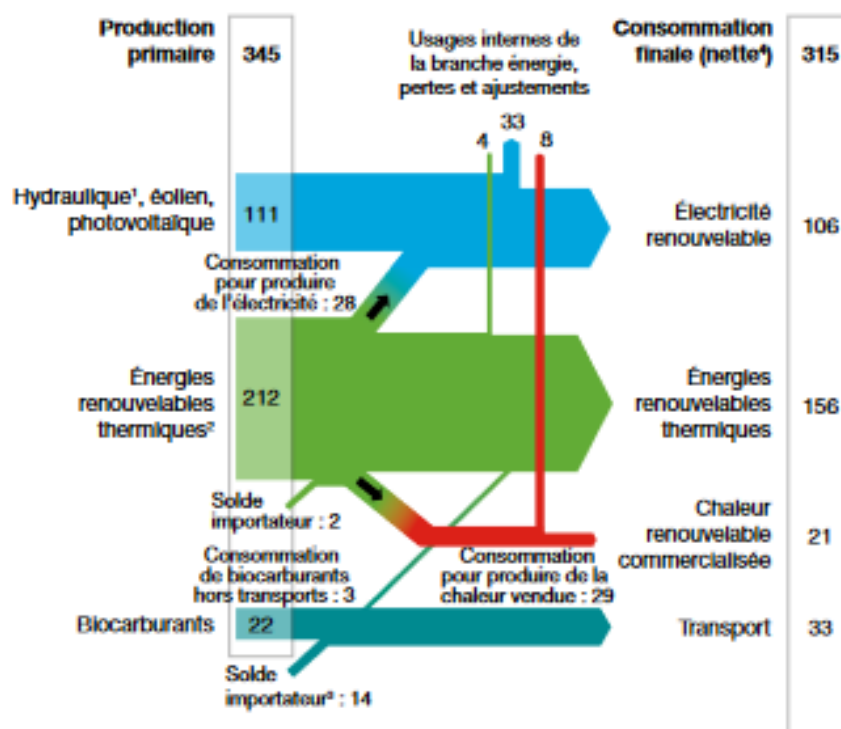


Figure 6: Final energy consumption in transport in 2022 (TWh) – Source: SDES

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

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 SDCS

Figure 7: Energy balance of renewable energy in France in 2021 (TWh) –

Source: SDES *

1.2.1.1. The production of energy

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

Domestic coal production has been completely halted since 2004. National gas and oil production accounts for around 1 % of consumption and will decline with the phasing out of hydrocarbon research and exploitation in France endorsed by Parliament on a proposal from the Government in 2017, making France one of the first countries to definitively abandon 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 contribution to the common security of supply. The graph below shows the predominant role of nuclear and renewables in this production.

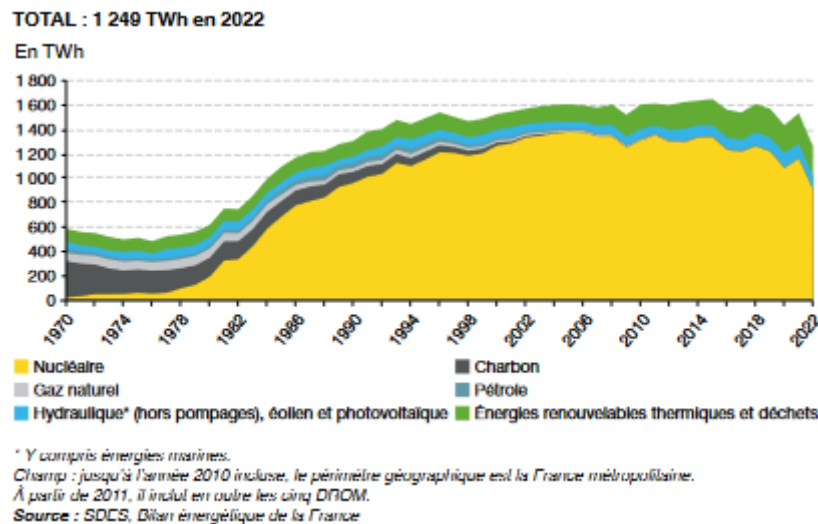


Figure 8: Primary energy production in 2022 by origin (Mtoe) – Source: SDES *

1.2.1.2. The French electricity production park

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

The vast majority of power 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 broken down as follows: 62.2 % nuclear 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 capacity of 61.4 GW. All reactors use pressurised water technology (PWP).

There are several “bearings” of nuclear reactors in France:

- **CP0: 4 reactors of 900 MW: these are the oldest reactors 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 today in 2024**

The main renewable power generation pathways are the following (capacity as at 31 December 2022):

- **25.7 GW hydraulic: the hydraulic capacity has been stable since the late 1980s;**
- **20.6 GW of onshore wind: the increase 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), in particular 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 resources has been declining sharply since 2012;**
- **3.1 GW of fuel oil production 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 low nuclear and hydropower production in that year. It imported for the first time since 1980 (net balance sheet of 16.5 TWh imported).

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

By way of comparison, total electricity production in France reached 522 TWh in 2021, while nuclear production accounted for 69 %.

1.2.2. Lessons learned from PNIEC1

A first review of PPE2 is presented in section 1.1.2 above.

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

Ecological planning puts society on the move to reach 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 consistent with our policy objectives.

This new comprehensive method of the green transition, entrusted for the first time in the country's history directly to the Prime Minister, **aims to act in a coordinated manner to:**

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

It **sets a framework for reflection, action and commitment** to ensure that everyone – citizens, local authorities, businesses and associations – has appropriate and ambitious objectives, and to mobilise in this context commensurate with their resources, competences and impact. Because the topics are numerous, complex, and not all the answers are known by 2050, this framework will evolve in the long term to operationalise the French and European climate objectives. It **integrates all the themes of the green transition** with a direct impact on the lives of French people for the future: to move better, to protect and value our ecosystems, to feed better, to produce better, to be better housed and to be better consumed. It is built around these 6 themes, deployed in 22 “sectoral” projects, supplemented by 7 transverse sites⁶, to organise our action.



Figure 9: Ecological planning sites – France Nation Verte

The **French Energy and Climate Strategy (SFECE)** integrates **mitigation planning documents**: the SNBC, **d'énergie**: EPP (multiannual programming of the energy), and **adaptation**: the National Climate Change Adaptation Plan (PNACC). It is the result of this ecological planning process, which was intended by the President of the Republic.

Within it:

- the **National Low-Carbon Strategy (SNBC)** is the framework for action on climate change **mitigation**: it seeks to translate the greenhouse gas emission reduction targets into annual emission reduction trajectories by sector and to describe precisely the assumptions considered to achieve them and the associated measures.
- the **multiannual programming of the Energy Community (EPP)** is intended to describe precisely the guidelines for energy policy and, in particular, to reflect our **ambitions in terms of reducing our consumption and developing the means of decarbonised energy production**.

The 6 7 cross-cutting projects deal with issues that irrigate all sectors and thematic sites: financing, spatial planning and differentiation, sectoral transition, environmental data, exemplary public services, just transition and resource efficiency.

Ecological planning sets general objectives, trajectories, policy levers and financial means to support actors. The government's strategy emphasises, in particular, the practical implementation of these objectives on the ground, through fair, realistic and desirable projects for all French people. In order to respond effectively to these challenges, to identify and respond to the social impact of the proposed measures, the preparation of SNBC 3 and EPP 3 is based on extensive consultation and dialogue with many stakeholders (representatives of the business community, representatives of employees, associations, communities, NGOs), which has been initiated since October 2021.

CALENDRIER D'ÉLABORATION DE LA SFEC



Figure 10: Timetable for the development of the French energy and climate strategy

In this context, the State has:

- Involving all stakeholders (scientists, economic operators, the State, local authorities, associations, etc.) through a dedicated committee and sectoral experts through workshops and working groups (WGs) to discuss the first hypotheses and levers to be mobilised;
- Involve citizens through consultation phases to gather their guidance on the country's climate and energy policy;
- Accompanied by economic actors in the most emitting sectors in identifying the decarbonisation levers available to them and their operational translation into

decarbonisation roadmaps (Article 301 of the Climate and Resilience Law, roadmaps of the strategic sectoral committees of the National Council of Industry, roadmaps of the 50 most emitting industrial sites, etc.).

(1) a participatory and inclusive process

A first public consultation was held between 2 November 2021 and 15 February 2022, covering a wide range of issues at stake in the low-carbon transition. During this consultation, 14 325 contributions and more than 100 stakeholder specifications were submitted. The contributions received were the subject of several analyses available online⁷. Across all themes, some main lessons can be drawn from these contributions:

- 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 (communities, businesses, citizens) in a spirit of pedagogy, transparency and co-construction with all stakeholders (businesses, citizens, environmental associations, experts, etc.). Expectations have also been expressed on 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 part of a broad acceptance. It can be applied at all levels and in all sectors of activity. The future French energy and climate strategy will have to give 'sobriety' its full role as a lever for achieving our climate and energy objectives.
- In order to explain and accompany the behavioural changes needed for the transition, greater efforts will have to be made **to raise awareness, pedagogy and educate citizens** in all sectors of intervention.
- Participants also focused on **social justice** issues 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.

A second phase of public consultation on the "energy mix of tomorrow", conducted among citizens, 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 resulted in 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 stocktaking report of the guarantors⁸ submitted on 10 March 2023, are available online. Several lessons can be learned from this citizens' consultation:

- **Sobriety has been described as a real subject of society**, to be placed at the heart of the new model we need to invent. There was consensus that it is important that sobriety should not be confined to an accumulation of individual gestures, but that it is a collective matter that embraces all actors – state, communities, businesses, etc.
- Citizens demand "**clear, transparent and easily accessible information for everyone**", from information on their energy consumption to better control them, to information on the various existing aids and on the conditions to benefit from it, and information on the right steps to be taken. This request for information is in addition to a request for training, from the youngest, to the right gestures and behaviours to be adopted.

⁷ <https://archivephase1.concertation-strategie-energie-climat.gouv.fr/bilan-consultation>

⁸ <https://www.ecologie.gouv.fr/concertation-sur-mix-energetique-publication-du-rapport-des-garants-commission-nationale-du-debat>

- The report makes it very clear that there is a consensus on the need **to define in advance our energy needs** and, consequently, to define precisely for each mode of energy production, a clear direction for the years to come. Participants want local authorities to play a central role in this planning.

(2) mobilising economic actors through the development of decarbonisation roadmaps

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

The first 7 roadmaps (automotive, air transport, heavy vehicles, maritime, building lifecycle, development, digital) are finalised and published⁹. The remaining 3 roadmaps (waste, livestock and cereals) will be produced by the end of 2023. On the industry side, roadmaps for mining and metallurgy, cement, chemicals and paper board were published in 2021 and 2022. They are currently being revised with the aim of raising their decarbonisation objectives, always guiding the achievement of carbon neutrality in 2050. Work is also ongoing by the agro-food, tiles and brick industries and lime industries.

These documents are the proposals for a roadmap for decarbonising the sectors addressed to public authorities to feed green planning sites. They do not constitute the government's roadmap and the proposals for the development of public policies contained therein are not binding on the State. Exchanges with economic actors will continue in order to achieve objectives and commitments shared between the State and economic actors. However, these roadmaps show real ownership of the green transition challenges by economic sectors. It is essential for the Government to take on board all the stakeholders, who are the actors in the field of implementing the transition.

3) a relay to parliamentary debate

On the basis of all the contributions received during these consultations and technical work, and in order to organise the relay to the forthcoming parliamentary debate in early 2024, the Minister for Energy Transition set up 7 working groups to update our country's energy and climate strategy. These groups, composed of parliamentarians, local elected representatives, professional federations, social partners, experts and environmental associations, have been tasked with building consensus on the major issues at stake in energy programming and identifying concrete solutions and best practices arising from the reality on the ground. They submitted their proposals on Tuesday 12 September 2023¹⁰. These proposals have fed into the multi-annual energy programming and national low-carbon strategy projects and will feed into future legislative work.

Before their final adoption, the **SNBC and the EPP will be submitted to several bodies** for consultation (High Energy Council, National Council for the Green Transition, HCC, etc.), they will be subject to an **environmental assessment** and **re-consultation of the public electronically**.

SNBC 3 and EPP 3 will finally be **adopted by decrees published in the Official Journal** in 2024.

⁹ <https://www.ecologie.gouv.fr/feuilles-route-decarbonation-des-filieres-plus-emettrices>

¹⁰ <https://www.ecologie.gouv.fr/dossier-presse-travaux-preparation-strategie-francaise-energie-climat-restitution-des-groupes>

1.2.4. Regional Cooperation

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 production 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 is strengthening cooperation between all stakeholders to contribute to a reliable, decarbonised and efficient electricity system based on integrated and well-functioning markets. As the electricity sector plays a crucial role in decarbonising all our societies by 2050 at the latest, the Penta countries aim to further increase the share of renewables and fully decarbonise their electricity system as soon as possible and ideally by 2035.

Cooperation is led by ministers responsible for energy policy, who meet regularly. The activities are monitored by the Penta coordinators under the direction 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 who 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 penta coordinators. The Support Groups also liaise with other international fora, such as the North Seas 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 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 moved from a purely national political perspective on energy markets to a regional approach. The 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 creation. From the outset, 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, on the one hand, and risk preparedness, on the other. 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, 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 extensive expertise and knowledge in this area, additional sensitivity analyses could be carried out by Penta's TSOs, focusing on the Penta

region and taking into account regional specificities and cross-border interdependencies. The topics that deserve to be further developed at regional level are:

- The articulation between national energy system planning, 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 network capacity 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 market in electricity and the operational security procedures of TSOs. The Penta countries will seek efficiency solutions between all relevant 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 provisions 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 the 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 at 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 seek to close the existing 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 Pentalateral Energy Forum has two decades of experience in market integration. During this period, Penta witnessed and driven major changes in the political landscape, with 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.

Promoting future-proof market design

In recent years, work on market integration within Penta has expanded in terms of accents and topics. Ministers Penta put hydrogen firmly 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 renewable energy 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 “Flexibility”. These studies were carried out in the framework of Support Group 3 (SG3) on the future electricity system and will serve as a basis for the future work of the Penta Forum.

The Vision 2050 report 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.

In order to develop this future electricity system, the Penta countries recognise the need for a future-proof market design and will actively exchange on improving and implementing electricity market regulation, while highlighting areas where further work is needed. Based on their past experience, the Penta countries will work together to identify welfare gains from an integrated and market-based approach to policy issues that can 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 energy, 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 flexibility for market participants. Therefore, the Penta countries:

- Will exchange on 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 behaviour of market participants to the balance of the energy system through wholesale markets and to the operation of electricity networks in a secure and stable manner.
- Follow the development of technical requirements for additional electricity demand (e.g. heat pumps and other sources of flexibility) to ensure interoperability so that additional electricity demand is truly flexible.
- Work together on the implementation of flexibility provisions in future 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 developing 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, the Penta considers it important to save energy and to 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 and best practices on energy savings.

Decarbonisation

As described above, and building on previous work on Vision 2050, 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 better 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 Hydrogen Support Group was set up to advance Penta's work and close cooperation in the field of hydrogen. SG4 focuses on regulatory and market developments for hydrogen deployment in Penta countries, in relation to the national, European and international framework. Based on 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 develop common positions on 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, investment, 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 set the ambitious target of an installed capacity of 300 GW for offshore wind and 40 GW for ocean 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 production targets in 2050 with intermediate steps in 2040 and 2030 for the North Sea priority grid corridor under the TEN-E Regulation. The objectives for the NSOG priority offshore network corridor 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, renewable energy deployment and integrated strategic offshore development. 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 networks at regional level as quickly as possible, thus 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, which aims to:

- Creating synergies;

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

Energy ministers meet regularly in the framework of the NSEC. In 2023, the NSEC was composed of Belgium, Denmark, France, Germany, Ireland, Luxembourg, the Netherlands, Norway and Sweden, with the participation of the European Commission. On 18 December 2022, the Nordic Energy Ministers and the European Commissioner for Energy signed a Memorandum of Understanding on cooperation with the United Kingdom on offshore renewable energy. The establishment of this Memorandum of Understanding was provided for in the Trade and Cooperation Agreement between the European Union and the United Kingdom of 30 December 2020, builds on the NSEC and is distinct 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 investments and further reduce costs. To this end, existing barriers need to be removed and attractive investment conditions created. NSEC members are working together to make an important contribution to achieving these objectives through a regular multi-topic exchange of expertise 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.

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 penta coordinators. The following examples illustrate this approach: ports (SG1 and SG4), maritime spatial and network planning (SG2 and SG4), and how non-tariff criteria can enhance innovation on key challenges for accelerated, cost-effective and responsible deployment of offshore wind energy (SG1, SG3 and SG4). Finally, support groups work closely with other international fora, such as the Pentilateral Energy Forum and the Clean Industrial Forum, on terrestrial network planning, market agreements and stakeholder engagement.

Development of hybrid and joint projects

The NSEC SG1 serves as a platform to collaborate on potential offshore wind projects concepts and coordinated electricity infrastructure, including transmission infrastructure. The group's activity has intensified as 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 progressed.

In addition to joint projects on offshore wind, 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 relevant EU and national market provisions.

Therefore, SG1 members are developing opportunities for collaboration on hybrid projects as well as on possible legal, regulatory and commercial barriers. 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

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 limits of large-scale wind development in the North Seas and the impacts on other users of the sea. SG2 has compiled an inventory of 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 to 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 cumulative impact assessment of wind farms between energy, maritime spatial planning and environmental authorities.

Financing and support frameworks

Offshore tenders are a central topic for funding and support frameworks. NSEC members coordinate offshore tenders by sharing information on national tender schedules under SG3. Within the Working Group, countries also exchange best practices on tender design, grant free support, design elements supporting system and sector integration, as well as network connection schemes. In order to achieve these ambitious objectives, it is becoming increasingly important to implement joint projects.

This is why the Group is also looking at funding opportunities for 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 the 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 grid development plan for North Seas offshore networks under the EU TEN-E Regulation. In addition, SG4 aims to broaden the discussion on long-term grid planning to also include early development and increased 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 grow significantly, especially after 2030, due to its potential as a storage energy carrier and as a fuel and feedstock for hard-to-electrify activities. Several NSEC countries have announced targets for the production of decarbonised hydrogen on land and at sea. Under SG4, NSEC countries will exchange their first experiences with hydrogen in connection with offshore wind, and exchange knowledge on transport infrastructure, renewable energy development and offshore power-to-X production. They will work together to provide information on offshore hydrogen production, to discuss electrolysis deployment 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 broad engagement in this planning process with Member States and relevant stakeholders, including industry and NGOs, in order to anticipate and remove supply chain bottlenecks (e.g. port development and availability) in the deployment and acceleration of the development of our energy system in the North Sea. This is closely linked to the importance of maintaining 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 Interconnections in South-West Europe

The Quadrilateral Summit on Interconnections, bringing together the Spanish, French, Portuguese and Portuguese Heads of State and Government 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 overview of projects across the region and mobilises all actors, including transmission system operators and regulators. It is supported by the Commission in recognising these projects as projects of common interest and in mobilising European funding tools.

1.2.5. Administration responsible for the implementation of the INECP

Within the Ministry of Energy Transition (MTE), the Directorate-General for Energy and Climate (DGEC) is responsible for drawing up 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 Energy Directorate develops 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) in an economically competitive and environmentally friendly manner. It is also responsible for French nuclear energy policy. Within these policy areas, it integrates the challenges of climate change and ensures the development of clean technologies. The Directorate implements the Government's decisions on renewable energy;
- the Directorate for Climate, Energy Efficiency and Air develops and implements the policy on climate change, climate change adaptation and air pollution. It proposes measures to promote demand control and the rational use of energy for all energy uses, as well as measures to develop 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 Secretariat-General for Ecological Planning (SGPE), under the authority of the Prime Minister. The task of the EPGS 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 taken.

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

1.2.6. Territorialisation of the PNIEC

As far as climate change policy is concerned, the work carried out at national level on environmental planning has stabilised, in the form of a scoreboard, a first comprehensive vision of policy levers, by sector of activity, targeted at the MtCO₂eq avoided. The scoreboard provides the national overview of policy levers and targets for reducing greenhouse gas emissions by 2030. This national overview has been developed at regional level to serve as a basis for exchanges with local communities and stakeholders. These exchanges since autumn 2023, in particular in the context of the territorial COP and as **a continuation of the working groups set up by the Minister in the first half of 2023, will make it possible to territorialise the objectives of reducing greenhouse gas emissions and policy levers with stakeholders on the ground.** This mechanism for the shared implementation of environmental planning must ensure that the objectives are effectively achieved at national level.

As regards energy policy, the multiannual energy programming is a national planning document with, in particular, national targets for the development of renewable energies. EPP 3 will be the first EPP to see its objectives locally, territory by territory, following a bottom-up approach. The EPP 3 will make this territorialisation project a priority, co-constructing with local authorities the method to determine these local targets in order to ensure coherence between local and regional ambitions, local planning documents and national energy transition guidelines.

2. NATIONAL OBJECTIVES AND TARGETS

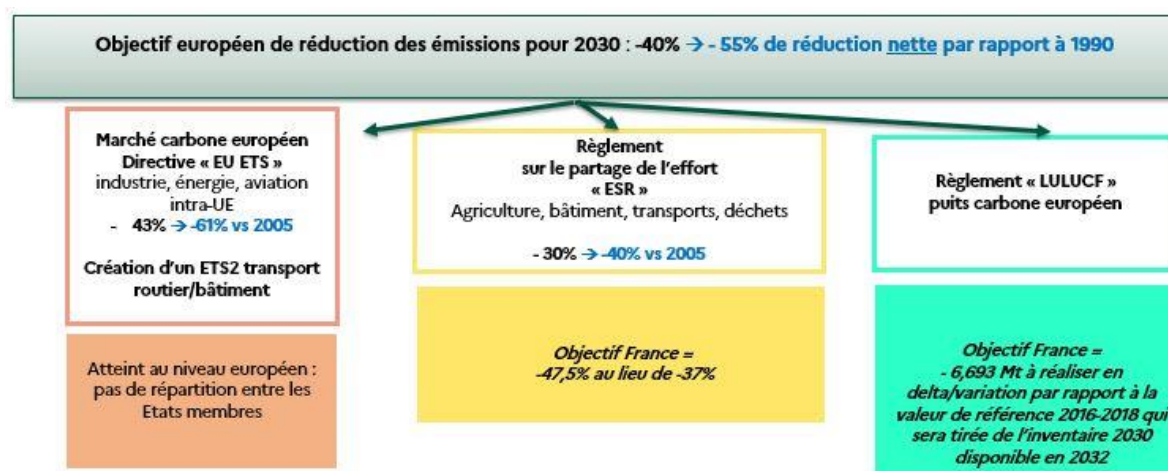
2.1. Decarbonisation dimension

2.1.1. Greenhouse gas emissions and removals

I

- European climate framework

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



Mitigation targets for France

Raising the French climate ambition for 2030

France's objectives are:

- — **50 % gross greenhouse gas emissions in 2030 compared to 1990**
- — **55 % net greenhouse gas emissions in 2030 compared to 1990**

In a context where forests are already severely affected by the impacts of global warming, with the impacts of climate change accelerating and amplifying the impacts of climate change compared to what was anticipated in previous studies, the new estimates of changes in the forest sink show a risk of a natural carbon sink deficit.

Work is being carried out to secure these volumes by means of additional measures. The government will continue and step up its action, through a balanced approach to the various challenges relating to forests, to preserve the carbon sink: massive support for the forest-based sector under the France Relance and France 2030 plans (in particular through the calls for forestry 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, needed to produce more carbon-sequestering biomaterials), incentives for afforestation, strengthening the means of preventing and combating fires, etc. In addition to these measures, the Government will work towards achieving the French and European objective of reducing net GHG emissions through additional measures to reduce greenhouse gas emissions. Ecological planning is an iterative process of continuously adjusting the roadmap to identify additional levers to compensate identified risk areas through modelling and new analyses and knowledge. These initial results will therefore be taken into account in the preparation of the final SNBC 3 in order to achieve the gross and net targets.

Modelling shows that the measures planned or planned by the Government make it possible to achieve -50 % of gross greenhouse gas emissions in 2030 compared to 1990, at 272 Mt.



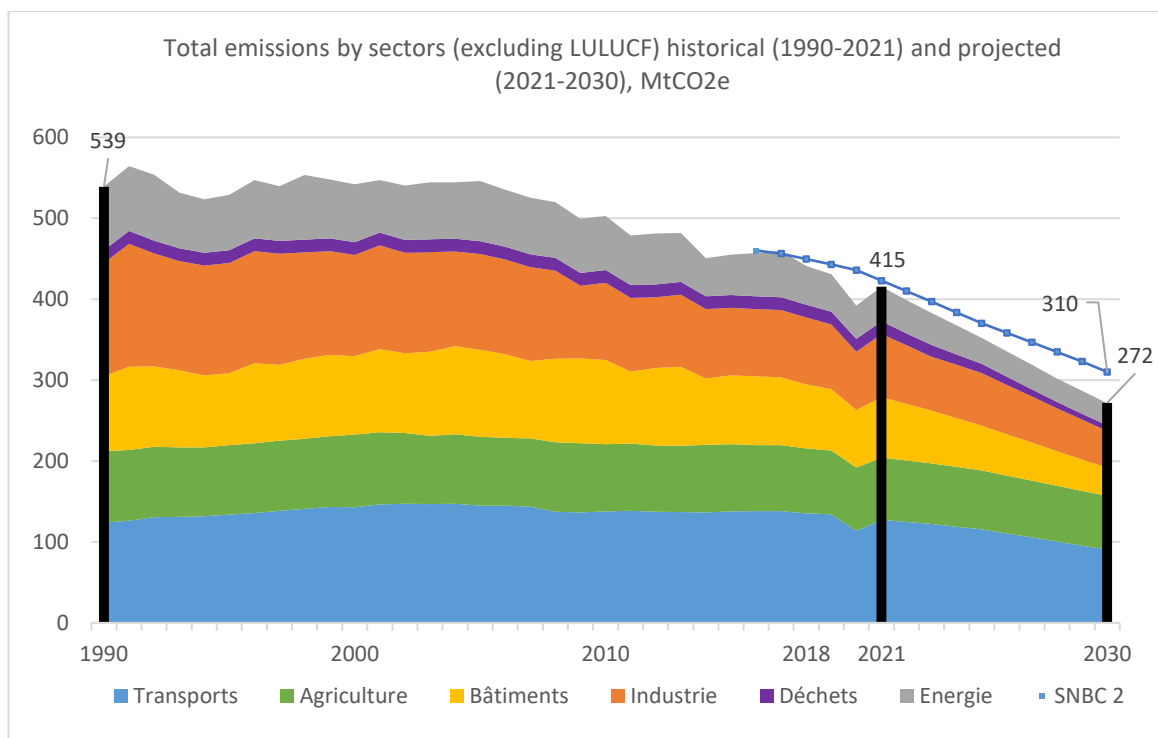


Figure 11: Changes in territorial greenhouse gas emissions (Sources: national greenhouse gas emission inventory, DGEC modelling)

In the short and medium term: carbon budgets

In the short and medium term, France **sets itself carbon budgets**, i.e. emission ceilings not to be exceeded in successive periods of five years. Carbon budgets are defined in the National Low-Carbon Strategy (SNBC). Carbon budgets are set in relation to France's target GHG emission reduction trajectory¹¹. This trajectory is the result of extensive modelling work, updated every time the SNBC is revised. This exercise becomes more accurate in each revision cycle¹².

The first three carbon budgets were adopted by decree in 2015 at the same time as the first SNBC (they covered 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** during the revision of the SNBC and 'future' budgets are adjusted if necessary to reflect updates in the French climate strategy, for example to raise our objectives, 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, adopted in 2020, set the 2th, 3th

¹¹ They are then broken down indicatively by main sectors of activity: transport, residential and tertiary buildings, industry, agriculture, energy production and waste.

¹² Foresight modelling is ongoing at national level. This is an **iterative** work, gradually incorporating the new data available and the effect of the measures envisaged. The first assumptions and trajectories presented in this document as the "SNBC 3 Provisional Reference Scenario" come from the **second iteration of the scenario exercise**. They are not definitive. Future work will allow these hypotheses to be adjusted with a view to reaching a final scenario in 2024 at the time of adoption of SNBC 3 and EPP 3 EPP 3. This final scenario will be described in the final version of the PNIEC.

and 4th carbon budgets for the periods 2019-2023, 2024-2028 and 2029-2033, in line with the French climate ambition 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).

Stocktaking of the first carbon budgets

- The first carbon budget of SNBC 1 (SNBC1 adopted in November 2015) covered the period 2015-2018. It averaged **442 MtCO₂eq per year**, excluding missions and removals for land use and forestry. This **first carbon budget totalled 61 Mt CO₂ eq** over the period 2015-2018 (+ 3.4 % over the whole period), but could be offset against the 2th carbon budget.
- The **carbon budget for the period 2019-2023 in gross terms (420 Mt CO₂eq) is on track to be respected**: emissions fell by 9,0 % in 2020 to 392 Mt CO₂ eq (mainly due to the COVID-19 crisis), increased to 415 Mt CO₂ eq in 2021 and decreased by 2.7 % in 2022 (404 Mt CO₂eq) based on the latest Citepa estimates (Secten 2023). Despite the post-Covid rebound, emissions remain below the annual gross trajectory set by SNBC 2 until the latest available data for 2022. The trend seems to be continuing as Citepa's latest barometer (October 2023) announces a **4.3 % reduction in GHG emissions in the first half of 2023**, excluding carbon sinks. The lower emissions in the 2th period (for the years 2019 to 2022 the deviation from the indicative annual carbon budgets¹³ is estimated at -61 Mt CO₂ eq) could compensate for the cumulative delay of the 1st period (+ 61 Mt CO₂ eq). Nevertheless, **net emissions**, given the significant decrease in the level of the forest sink, **France could exceed its second carbon budget**. The government will therefore continue and expand its efforts to preserve the carbon sink and will work towards achieving the French and European net GHG emission reduction target through additional measures in terms of further reduction of gross greenhouse gas emissions.

The 2nd carbon budget (2019-2023) will come to an end when the SNBC 3 final document is presented, so that it will not be subsequently modified by this new strategy (apart from technical adjustments related to changes in the inventory provided for in the Environmental Code¹⁴). On the other hand, the 3th and 4th carbon budgets (2024-2028 and 2029-2033) will be updated in line with France's new climate ambition (reducing France's gross emissions by at least -50 % in 2030 compared to 1990 and around -55 % net (including the land sector)) and the 5th carbon budget will be established (2034-2038). They will be fixed by decree when SNBC 3 is adopted.

¹³ The gap is assessed between the technically adjusted carbon budgets in 2023 * and the GHG emissions data of the national inventory produced by CITEPA (SECTEN edition 2023).

* The High Council for Climate published in its 2023 annual report the indicative annual carbon budgets for the second period, adjusted in the light of the 2023 CITEPA national greenhouse gas emissions inventory (SECTEN 2023). These adjusted carbon budgets remain indicative and provisional. The Environmental Code (Article D. 222-1-B) provides for the adjustment of carbon budgets in the event of changes in accounting for greenhouse gas emissions leading to a correction of more than 1 % of emissions for the reference years specified by decree **at the time of the carbon budget balance** (at its closure). **For the 2th budget (2019-2023), the closure and therefore the official adjustment if necessary will take place in 2025 (based on consolidated CITEPA data for 2023).**

¹⁴ https://www.legifrance.gouv.fr/codes/article_lc/LEGIARTI000041816442

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 exercise carried out.

The preliminary estimate of the distribution of carbon budgets **by activity areas**, rounded to the nearest 1 Mt CO₂ eq, is as follows.

Average annual emissions (MtCO ₂ eq)	Reference years			2th carbon budget (2019-2023)	3th carbon budget (2024-2028)		4th carbon budget (2029-2033)	
	1990	2015	2019	SNBC2	SNBC2	SNBC 3 (provisional)	SNBC2	SNBC 3 (provisional)
Transport	124	138	134	129	113	110	94	83
Buildings	93	85	76	78	61	51	44	33
Agriculture	88	83	79	78	72	71	67	65
Of which N ₂ W *	27	24	23	24	22	20	21	19
Of which CH ₄ *	50	47	44	43	41	40	38	37
Industry	139	84	80	75	65	60	53	42
Production of energy	79	50	46	48	36	32	30	26
Waste	16	15	16	13	11	10	10	7
Use of land, change in the allocation of land and forestry	— 17	— 37	— 18	— 41	— 41	— 8	— 44	— 17
Total (excluding LULUCF)	539	454	431	420	357	335	299	256
Total net (with LULUCF)	522	417	413	379	317	327	255	239

Table 4: Comparison between the carbon budgets (technically indicative and provisional adjusted in 2023¹⁵) of the SNBC2 and a provisional estimate of carbon budgets calculated on the basis of the provisional baseline scenario (source: MTE – DGEC)

¹⁵ The High Council for Climate published in its 2023 annual report the indicative annual carbon budgets for the second period, adjusted in the light of the 2023 CITEPA national greenhouse gas emissions inventory (SECTEN 2023). These adjusted carbon budgets remain indicative and provisional. The Environmental Code (Article D. 222-1-B) provides for the adjustment of carbon budgets in the event of changes in

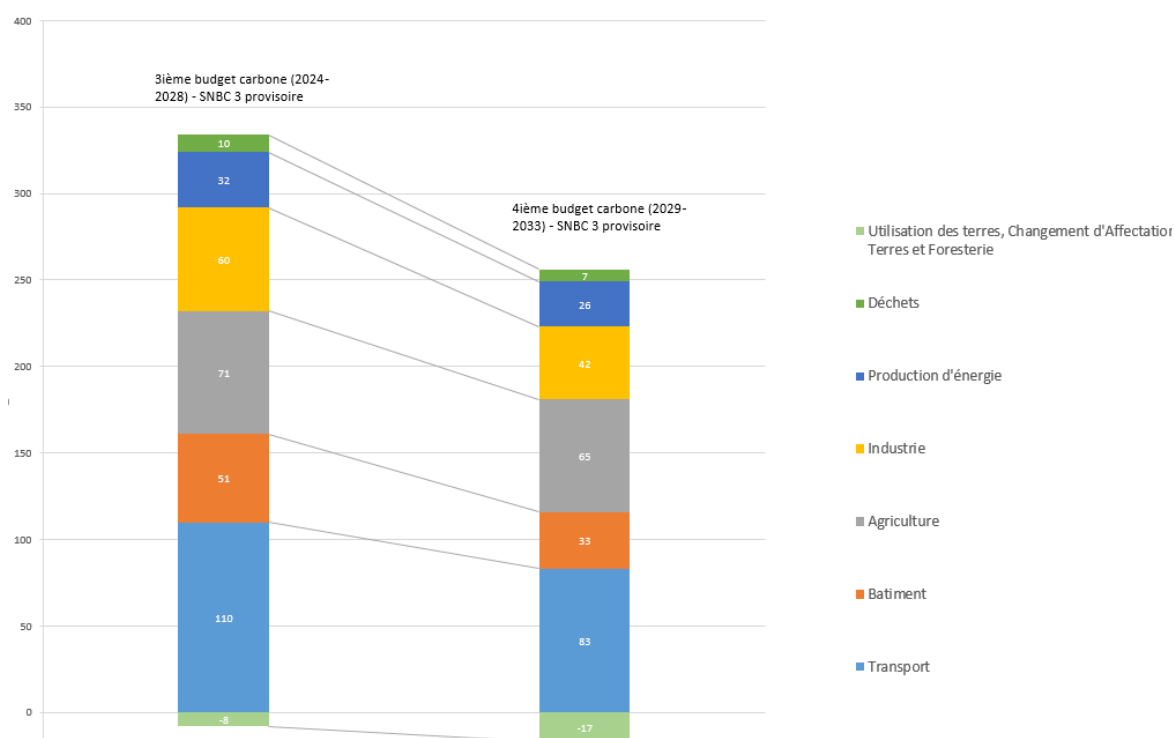


Figure 12: Sectoral breakdown of the provisional 3 and 4 carbon budgets estimate of SNBC 3 (provisional) calculated from the baseline scenario (source: MTE – DGEC)

Furthermore, under the Environmental Code, SNBC 3 will also include **indicative carbon budgets for international bunkers**. 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 (MtCO ₂ eq)	Reference years			2th carbon budget (2019-2023)	3th carbon budget (2024-2028)		4th carbon budget (2029-2033)	
	1990	2015	2019	SNBC2	SNBC2	SNBC 3 (provisional)	SNBC2	SNBC 3 (provisional)
International bunkers	16,9	23,4	24,8	/	/	23,2	/	22,7
of which international aerial bunkers	8,9	17,8	19,2	/	/	18,5	/	18,3

accounting for greenhouse gas emissions leading to a correction of more than 1 % of emissions for the reference years specified by decree **at the time of the carbon budget balance** (at its closure). For the 2th budget (2019-2023), the closure and therefore the official adjustment if necessary will take place in 2025 (based on consolidated CITEPA data for 2023).

of which international maritime bunkers	7,9	5,5	5,5	/	/	4,8	/	4,3
---	-----	-----	-----	---	---	-----	---	-----

Table 5: Provisional estimate of indicative carbon budgets for international bunkers calculated from the baseline scenario (source: MTE-DGEC).

Horizon 2050

France **reaffirms its objective of achieving carbon neutrality by 2050**, i.e. net zero emissions on national territory, a target set by the Government's Climate Plan published in July 2017 and now enshrined in law. **This objective is all the more ambitious as France plans to strengthen it by including from now on French emissions from international aviation and maritime transport (reported out of total in the national GHG inventory).**

A detailed plan comprising objectives, trajectories, policy levers and financial means has been drawn up for 2030. This was the Government's priority as an essential first step in putting the country on the right path towards achieving carbon neutrality.

The 2050 horizon is by definition subject to more uncertainty, and the trajectories set for that horizon will necessarily need to be updated in the coming years. Having said this, 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 ecological planning under the Prime Minister's leadership. The 2050 trajectories currently working with stakeholders will be subject to public consultation in the coming months, and can then also be transmitted to the Commission as part of the INECP development process.

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. The new reduction target set for France in this area is -47.5 % by 2030 compared to 2005 (instead of -37 %). The ESR obligation also 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. Each year, Member States must comply with each other by returning as many emission allocations¹⁶ they have emitted for the sectors concerned. These targets measure to a large extent the decarbonisation effort that France will have to make for the perimeter of these emitting sectors.

The provisional modelling prepared in the context of the SNBC revision shows that the **trajectory of ESR targets would be met in the baseline target scenario (AMS scenario), with a small surplus at the end of the period (215 Mt for a target of 211 Mt in 2030)**. This difference is part of the error margin of the estimate, especially as the share of emissions covered by the ETS for each sector is considered to be the same as in 2021. Cumulatively, the budget up to 2030 will be respected via this trajectory, independant on possible scourges with the LULUCF Regulation.

¹⁶ Annual Emissions Allocation – 1 AEA corresponds to 1 tCO₂eq

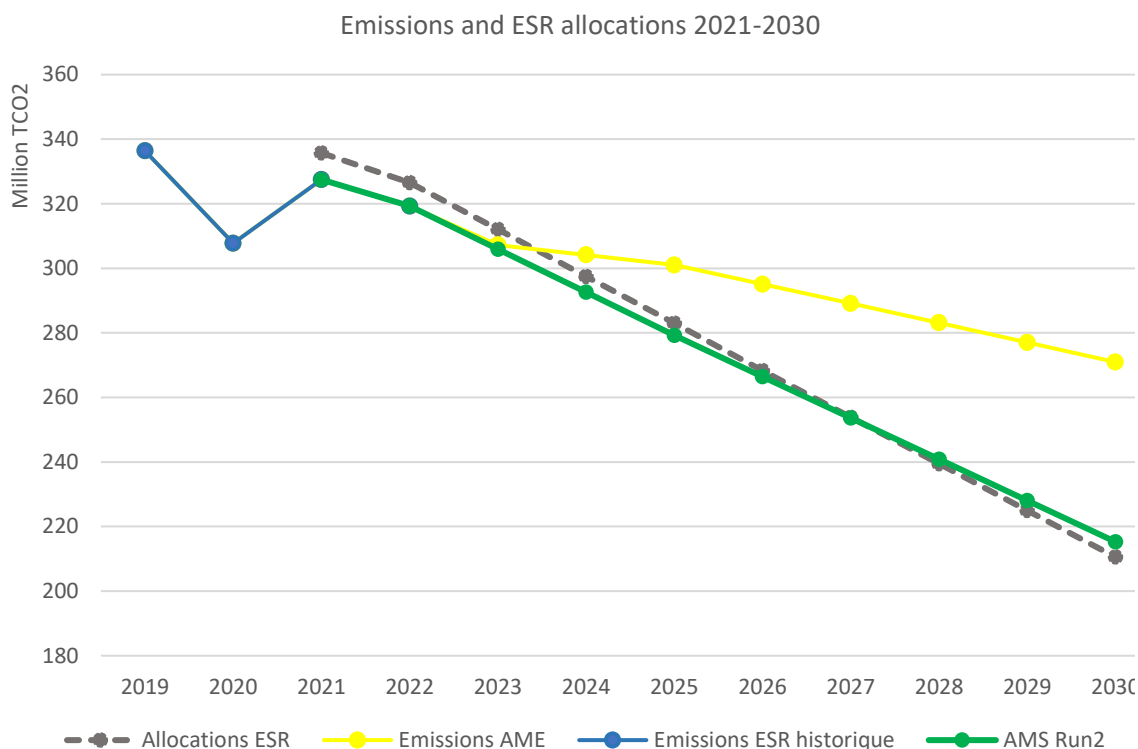


Figure 13: Emissions and ESR allocations 2021-2030

Application of Regulation 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 sectors, Regulation No 2018/841 provides for the application of accounting for emissions and removals from these sectors and a commitment by the Member States to ensure that emissions do not exceed removals during the period 2021 to 2025 ('no debit' rule) in accordance with that accounting. This **regulation measures the efforts that France will have to make in terms of forest management, strengthening long-lived uses for timber from French forests, and storing carbon in agricultural land** (e.g.: preserving grasslands, hedgerows, etc.) or reducing 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 are simplified and the Member States are given a target for 2030 (for France: -6,693 MtCO₂e improvement to be achieved between the average of the inventory 2016-2018 and the year 2030). This objective will be accompanied by a 2026-2029 budget to be set in 2025 on the basis of the inventory values for 2021 to 2023 (budget also set in "relative value").

The LULUCF sector (Land Use, Change in Land Affection and Forestry) is a sector for greenhouse gas removals – mainly carbon dioxide and their perennial sequestration. In 2021, the sector absorbed 17,1 Mt CO₂ eq. The carbon sink represented by this sector has fallen sharply within 10 years, largely due to the effects of climate change (drought, heatwave) resulting in increased

mortality and less growth in forests affected by climate change (drought, fires, pests). As a result of climate change, the French forest is currently experiencing a severe mortality and growth crisis, and researchers and experts find it difficult to decide on its duration and a potential exit from the crisis.

The 2023 edition of the inventory for 2021 estimates an average of the years 2016-2018 at approximately -23,4MtCO₂e. France's 2030 target should therefore, for the time being, be set at 30MtCO₂eq. To achieve this objective at national level, France's strategy is to stabilise mortality and the decline in growth in forests and to adapt them to climate change through a massive forest renewal plan and to use 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 upstream and downstream forestry: Forest renewal, Wood constructive system. These schemes will have to be complemented in the short term by incentives for afforestation, as well as strengthening the requirements for the preservation of forest soils.

Figure1: Earthing wells in AMS

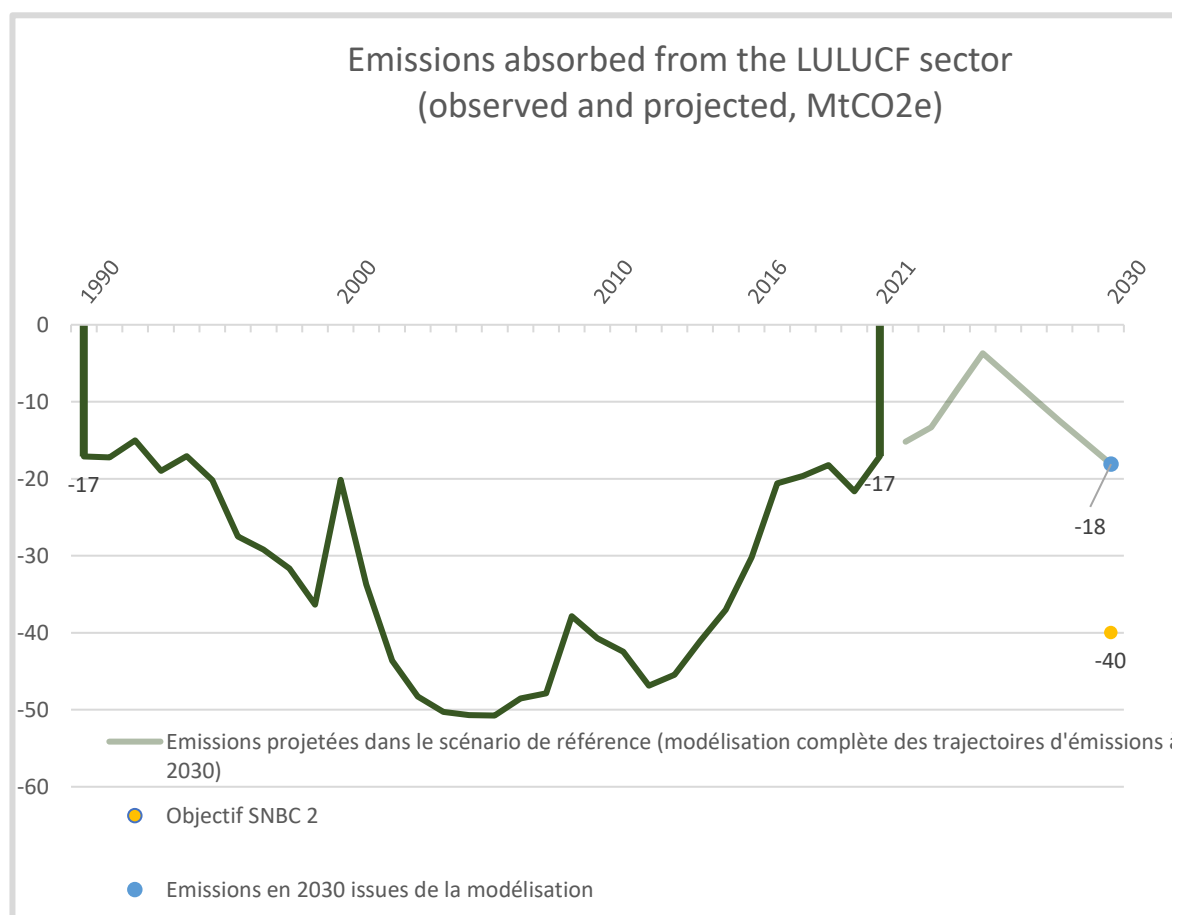


Figure 14: Emissions absorbed from the LULUCF sector (observed and projected, in MtCO₂eq)

Methane emissions

The Global Methane Pledge commits its signatories to a collective 30 % reduction in global methane emissions between 2020 and 2030. This statement covers all sectors of activity, but recognises that the main fields in the short term relate to the energy sector. The 30 % target is a collective target and the efforts to achieve it must be differentiated between sectors and regions. The prevention of methane emissions linked to human activity, in particular those in the energy sector, is also an important part of European action under the regulation currently being finalised, and one of the French authorities' priorities for COP28.

The preparation of SNBC 3 will focus on establishing a methane emission reduction trajectory consistent with this new target.

Adaptation objectives

France is currently preparing its third national climate change adaptation plan and will be able to forward it to the European Commission shortly.

France is implementing its second national climate change adaptation plan, with some adaptation policies and measures that 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 INECP.

The general objective of the National Plan for Adaptation to Climate Change 2018-2022 (PNACC-2) is to implement the measures necessary to adapt the territories of metropolitan 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 proportion of climate change that past greenhouse gas emissions accumulated in the atmosphere make inevitable. The assumption is a global average temperature increase of 2 °C compared to the pre-industrial era, even though France is acting domestically and internationally to limit the increase to 1.5 °C. National adaptation policy is therefore the essential complement to our climate change mitigation policy aimed at achieving carbon neutrality.

For example, the **National Plan for Adaptation to Climate Change, adopted in December 2018**, provides for several measures to promote the adaptation of forests to climate change. In the work on EPP and SNBC, some interactions between climate change and the energy system have been taken into account (e.g. changing consumption in buildings).

Other policies and measures are mentioned in Section 3.1.4.

CCS/CCU

CO₂ capture, storage and valorisation technologies 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, CCS is planned to address non-compressible residual emissions and should therefore be complementary to 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 early as 2027. The volumes of CO₂ captured could reach 4 to 8,5 MtCO₂ per year by 2030 and between 20 and 25 MtCO₂ per year in 2050 for the industrial sector. By that time, additional volumes of captured CO₂ will also be needed beyond industrial emissions to contribute to removals and the climate-neutrality objective.

At national level, the development of so-called CCUS technologies is supported under the 'France 2030' investment plan through the strategy for decarbonising industry with an overall budget of EUR 5,6 billion. Under the innovation strand, the development of new capture technologies for CO₂ is eligible for ADEMIBaC and IBAC PME calls for projects. A new support scheme through 'Carbon Contracts for Difference (CCfD)', aimed at supporting investments in the deep decarbonisation of industry, in the form of 'CCUS' like other intensive disruptive capital technologies, in a technologically neutral approach, was announced in June 2023 for a launch in the course of 2024.

France does not yet have a geological sequestration capacity for CO₂. Studies to assess these capabilities will be launched in 2024. In addition, the 'France 2030' investment plan could devote EUR 25 to EUR 30 million to support the carrying out of studies or works aimed at improving knowledge of the capacity of the French subsoil in terms of storing CO₂ (seismic campaigns or injectivity tests).

Finally, the deployment of CCUS in France requires reflections on the transport of CO₂, for which different methods may be envisaged, such as pipelines, or alternatively the train, the barge or the lorry. The relevance of these various vectors is currently the subject of a consultation of the sector, which should feed into the reflection on the models for controlling CO₂ transport to be provided in order to enable the sector to develop properly, and to a task entrusted to the Energy Regulatory Commission.

2.1.2. Low carbon energy

Renewable energy targets are enshrined in the Energy Code. By then, the Code plans to increase the share of renewable energy to 23 % of gross final energy consumption in 2020 and 33 % of gross final energy consumption in 2030.

The multiannual energy programming under revision, as well as the forthcoming law on energy production, will update these targets.

The next EPP will set more ambitious targets than the previous EPP to get out of fossil fuels. This involves:

- Electrification of uses, leading to an increased level of decarbonised electricity generation to at least 640 TWh in 2035. This is a key element of the French strategy as electrification is in many cases used to bring about intrinsic energy efficiency gains.
- An upward revision of the targets for the development of photovoltaic electricity (54 to 60 GW in 2030, compared to a target of between 35,1 and 44 GW in 2028 in the previous EPP), while prioritising development over already artificial spaces, at least maintaining the current rate of development of onshore wind and accelerating the rate of allocation of offshore wind capacity to 18 GW of installed capacity in 2035;
- The development of renewable heat (more than 250 TWh in 2030 compared to a target of between 219 and 247 TWh in 2028 in the previous PPE) and recovery (20 TWh in 2030 compared to a target of between 7,6 and 9.9 TWh in networks in 2028 in the previous PPE).
- Development of biomethane (approximately 50 TWh of biogas, of which 44 TWh injected by 2030, compared to a target of between 24 and 32 TWh (of which between 14 and 22 TWh injected) in 2028 in the previous PPE);
- The increase in the use of biofuels, amounting to approximately 48 TWh in 2030.

- The recovery of the nuclear sector:
 - Elimination of the objective of closing down nuclear reactors;
 - Continued 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;
 - Continuation of the work programme, carried out by EDF, aimed, during the planned maintenance periods, at increasing the available power (*uprating*) and the annual production of existing reactors, in strict compliance with the safety framework;
 - Support for the 6 EPR2 construction programme, carried out by EDF, with a view to a final investment decision by EDF's Board of Directors with a view to launching it by the end of 2024;
 - Further study of a possible reinforcement of the nuclear power programme, carried out by EDF, 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;
 - Support for EDF's Nuward project to develop a small modular reactor by aiming to achieve the milestone of a first concrete for a first reference plant in France by 2030;
 - Support for disruptive innovation through the France 2030 plan, aiming at a decision to launch at least one prototype of a small innovative nuclear reactor by 2030;
 - Confirmation of the continued semi-closure of the fuel cycle and in this direction shall continue work on the renewal of the nuclear cycle downstream facilities (recycling treatment) to allow for decision making, in particular on the post-2040 strategy, by the end of 2026 at the latest, while ensuring that measures are taken to ensure that the needs of existing downstream infrastructure are met by 2035 and by establishing an investment-friendly economic framework.

2022 was a record year in terms of renewable electricity installations put into operation with more than 5 GW in one year. The onshore wind farm increased by 1.9 GW in one year, from 18.7 at the end of 2021 to 20.6 GW in December 2022 (compared to + 1.7 GW in 2017). The development of the solar park continued at a very fast pace for the second year in a row, with an additional 2.6 GW. It is on the basis of this experience that the above deployment rates have been established.

The trajectory set by the revision of the French energy and climate strategy and reflected in the CNECP will enable France to reach 58 % of its final energy consumption and 71 % in 2035, which fully contributes to the European targets. The French production strategy also provides for the full coverage of 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 on the European continent. In the same spirit of responsibility, the scenarios for accelerating NERs in France provide for a cautious floor 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 greater and France will allow itself to support the development of renewable energy sources to the maximum and beyond that objective, so as to get out of fossil fuels more quickly, as the acceleration of the deployment of renewable energy already committed is confirmed. In addition, the French electricity mix, composed mainly of nuclear and renewable energy, is already decarbonised at almost 90 %.

The priority is to meet the objectives of exiting fossil fuels, through 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	National target of 30 % in 2030 compared to 2012	2030
Primary energy consumption	Achieve a primary energy consumption of 157,3 Mtoe (or 1 830 TWh)	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
Installed electric RES capacities	<p>In 2030: PV: 54 to 60 GW Terrestrial link: 33 to 35 GW Eolien at sea: 3.6 GW Hydropower (including STEP): 26.3 GW</p> <p>In 2035: PV: 75 to 100 GW Terrestrial link: 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
Nuclear production capacity	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 from energy used by 14.5 % in 2030 and 25 % in 2035	2030 and 2035
Renewable gas production capacity	Injection into the gas network of 15 % renewable gases in 2030	2030
Installed flexibility capacity	25 GW in 2030 and 35 GW in 2035	2030 and 2035

Table 6: Summary of EPP objectives 3 EPP 3

- **Electricity production**

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

Despite an overall decline in energy consumption, electricity consumption will increase sharply due to the electrification of many uses to account for more than 50 % of our energy consumption by 2050. This leads to **a clear shift in the need to develop decarbonised electricity from 2025 onwards and to the need for nuclear production to rise from its 2022 level.**

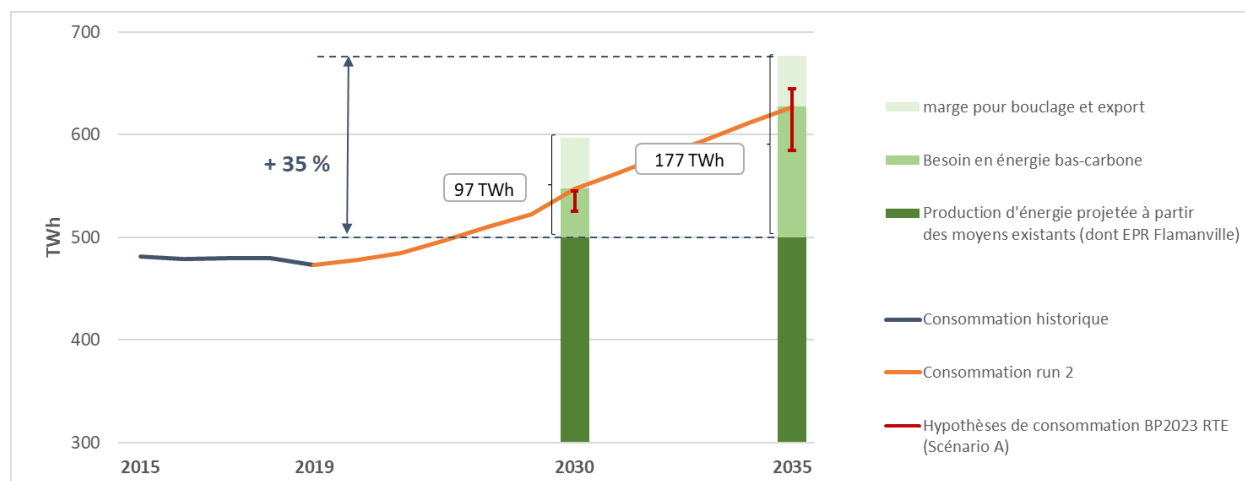


Figure 15: Projection of electricity consumption at 2030 and 2035 (Source: SGPE/DGEC modelling)

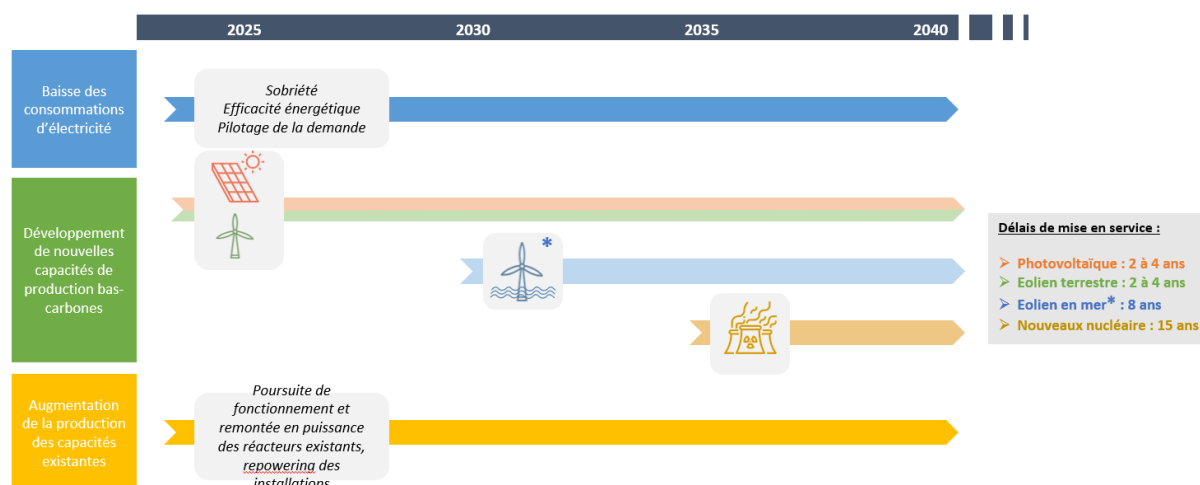
In order to cope with these increases in consumption, it is necessary to rely on an electricity mix based on the two available low-carbon production pillars – nuclear, with the reinforcement of the production of the existing fleet and the construction of new reactors, and electric renewable energy, which will have to be strongly developed, taking into account the development times specific to each sector. The analyses, including those of RTE initially presented in its report “Futurs Energiques 2050” published at the beginning of 2022 and subsequently supported by its 2023 forecast report showed that the logic of adding low-carbon electricity production, through the development of renewable energies and the extension of existing nuclear reactors, increased the chances of achieving our climate targets and was cost-effective.

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

- By 2030, 7 offshore wind farms from calls for tenders 1 to 3 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, in the process of being allocated, planned or resulting from the ongoing planning exercise will provide a complementary contribution;
- After 2035, the gradual deployment of new EPR 2 and small modular or innovative nuclear reactors, as well as the continued operation of the existing nuclear reactor fleet, will significantly strengthen the power generation fleet as a complement to renewable energy.

Over the whole period, EDF’s objective of achieving an annual nuclear output of more than 400 TWh will be maintained. The development of hydropower capacities is possible and necessary: although the total energy produced will not necessarily increase as a result of the likely impact of climate change

on water resources (drop in flow), the development of total installed capacity will be a valuable lever for balancing the electricity system for both peak consumption and total production.



* Offshore wind projects launched since 2010 will gradually join the production park, amounting to 3.6 GW in 2030, of which 1.5 GW were already in operation at the beginning of 2024. Therefore, only the time horizon for new projects to come into operation is displayed here. This graph does not present the challenge of increasing the nuclear production of the existing fleet, since it is not new capacity.

Figure 16: Timing of the levers available to ensure energy loop in electricity

Electric renewable energy

By 2035, it will be necessary to produce almost 140 TWh of additional electricity from renewable energy sources per year. This will be possible by the proactive deployment of all sectors (photovoltaic, wind and hydropower) to reach approximately 120 GW in 2030 and between 160 and 190 GW in 2035, which implies in particular:

- For photovoltaic: double the annual rate of development of new capacity by working towards a balanced distribution between ground power stations (65 %), large roofs (25 %), and residential (10 %);
- For onshore wind: keep *the current pace at a minimum*.

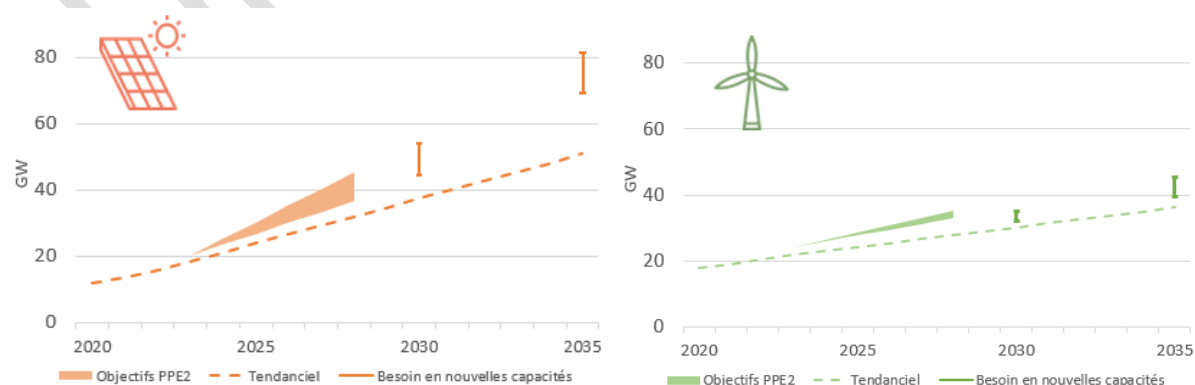


Figure 17: Trajectory for the development of onshore renewable energy in GW (Source: DGEC modelling)

Short-term flexibilities for offshore wind are more constrained. Given the deadlines for commissioning, the offshore wind capacity installed in 2030 may not exceed 3.6 GW. **The challenge will 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).**

While offshore wind development has significantly accelerated since 2019, with extensions already identified for some parks, long-term planning is needed to reach a target of more than 40 GW or even 45 GW in 2050. **To secure this trajectory at 2035, the EPP 3 will include allocating an additional 8 to 10 GW by the end of 2025, following the maritime facade planning exercise to be carried out in 2023 and 2024.** The State will also continue to support the development of the hydrolink sector, in particular through pilot projects or demonstrators, and will pay attention to changes in the costs of the sector.

As regards hydropower, which is today the first source of renewable electricity (42 % of renewable electricity production and a total capacity of 25.7 GW), **the target will be to increase installed capacity by 2.8 GW by 2035, largely on existing installations.** These 2.8 GW will include about 1 700 MW of pumped energy transfer stations – essential to increase our electricity storage capacity – 640 MW on installations above 4.5 MW (concession scheme) and 485 MW on installations below 4.5 MW.

Based on the current modelling, LPEC and EPP 3 could set the following targets for the development of electric renewable energy:

Installed capacity in GW	2022	2030	2035
Photovoltaic	15.7 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 (including STEP)	25.7 GW	26.3 GW	28.5 GW

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

Energy produced in TWh	2022	2030	2035
Photovoltaic	18,6	65	93
Onshore wind	39	64	80
Eolien at sea	0,6	14	70
Hydro-electricity (excluding STEP)	43	54	54,5
Total	101,	197	298
			Or + 197 TWh/2022

- **National targets for establishing a renewable energy community in each municipality with more than 10 000 inhabitants.**

The State is actively supporting the development of citizens' projects (bonus in invitations to tender, legislative provisions in the law on accelerated production of renewable energies (APER), etc.). At the time it was not envisaged to impose targets on a local mesh.

- **National targets on the determination of go to areas**

Article 15 of the Law on Accelerating Renewable Energy Production (APER) introduced, in addition to the measures for the simplified revision of urban planning documents for the reception of renewable energy, bottom-up territorial planning from the local authority level. Currently, the bottom-up planning scheme introduced by the Renewable Energy Acceleration Law (APER) is being put in place.

This approach allows local authorities to be strongly involved in the process at an early stage, so that the areas identified by the municipalities can achieve the objectives of the multiannual energy programming. They are the equivalent of the mapping requested in the Directive. The “go to areas” (or “accelerations areas”) may subsequently be studied among these areas, which are de facto excellent candidates as they come from the strong political will of local and regional authorities and ensure good local acceptability through a very early public consultation.

These renewable energy acceleration areas proposed by the municipalities will be the subject of broad consultation at departmental level and will be subject to the opinion of the Regional Energy Committee, which will see its role in the planning and territorial implementation of energy objectives strengthened. The areas proposed by the municipalities will not be exclusive zones but will focus on demonstrating the political will of the municipalities and local acceptability to accelerate renewable energy.

The Parliament has introduced provisions regulating the deadlines for public inquiries and investigations in these areas in order to create a real effect of training and ownership of the energy transition by the territories, in addition to the measures to promote projects in these areas in tendering procedures for the granting of state support.

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

- **Integrate offshore renewable energy development objectives into their 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 facade level (instead of project-by-project) in order to ensure transparency and long-term visibility for the public and the sector. The 2023 law on the acceleration of renewable energy production (APER) makes it possible to pool public debates on the updating of strategic façade documents (FMD) planning the use of maritime space, and public debates on offshore wind. The APER Act also provides for offshore renewable energy planning with the formalisation of a mapping of priority areas for the development of future offshore wind farms. The State referred the matter to the National Commission for Public Debate in March 2023 on the update of the FMD and the development of offshore wind. A public debate must therefore be launched on each façade in autumn 2023.

For offshore wind, the aim of the discussions is to identify 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 following a series of technical and environmental de-risking studies. In particular, the State will launch one or more high-capacity tenders (in the range 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.

Nuclear power production

The law on speeding up procedures for the construction of new nuclear installations in proximity to existing nuclear sites and the operation of existing nuclear installations repealed the objective 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 intention of the legislator.

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 ten-year safety reviews will periodically validate the capability to continue operation for each reactor. The Government also calls on EDF to conduct 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, particularly with regard to the challenges associated with water resources.

EDF is carrying out a work programme aimed at increasing the available power of existing reactors during the planned maintenance periods, in compliance with the safety framework. The nuclear production expectations for the coming years will take into account the power increase in nuclear power that would result from the implementation of this programme. The Government sets EDF the objective of returning to the best levels of operational performance, with the aim of returning to nuclear production of more than 400 TWh by 2030 (including Flamanville 3 EPR).

The nuclear fuel processing/recycling strategy will be preserved over the EPP period and beyond. With a view to renewing the facilities downstream of the nuclear cycle, the nuclear sector will carry out work by the end of 2026, under the supervision of the Government, 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 included in the successive revisions of the multiannual energy programming.

EDF is carrying out a construction programme of 6 EPR2, comprising two reactors at the Penly site, two at 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 EDF's Board of Directors with a view to launching it by the end of 2024.

The Government will study further the possibility of strengthening the nuclear power programme, by means of a work programme with EDF and the operators concerned to investigate the issues relating to the dimensioning, just need and adaptation of the EPR2 design, 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.

The nuclear sector will undertake, in conjunction with the CEA, work to define the advisability of deploying MRS in France, in addition to 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 oversee this work and, in parallel, carry out discussions to prepare, if necessary, the identification of sites relevant to MRS in France. Alongside its programme for the construction of new high-power reactors, EDF is carrying through its subsidiary NUWARD SAS the Nuward project for the development of a small modular reactor (SMR) with pressurised water of 170 MWe. The government confirms its

support for this project, which is financially supported by 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 view to a decision to launch at least one prototype of a small innovative nuclear reactor with different technology by 2030. This target may be updated by this deadline.

In addition, the CEA will undertake, in connection with the nuclear sector, work to identify the fuel needs associated with the new concepts of innovative nuclear reactors, and the adjustments to 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 on the closure of the fuel cycle, in line with the work carried out by the nuclear sector on the future of downstream industrial installations post-2040. The CEA will carry out, in connection with the French nuclear sector, a programme of investments in nuclear research infrastructures in order to maintain research capacity in the nuclear sector at the forefront of all the priorities of the Government's nuclear policy.

The Government calls on EDF, in conjunction with the relevant stakeholders, in particular Orano, to take measures to ensure that the requirements of existing infrastructure downstream of the cycle are permanently met by 2035 and beyond.

Renewable heat

Heat now accounts for just under half (43 %) of final energy consumption¹⁷ in France, of which only about a 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 make it possible to increase the consumption of renewable heat and recovery from 183 TWh in 2021 to 419 TWh for the high target in 2035. The EPP 3 targets lead to more than double the amount of renewable heat and recovery by 2035.

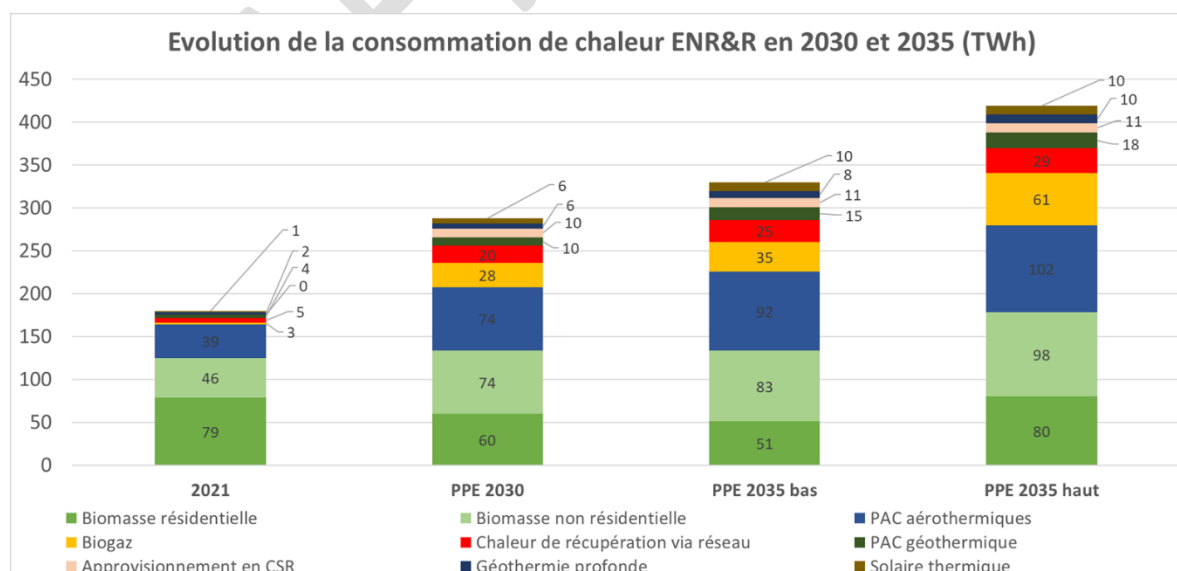


Figure 18: Evolution of heat consumption ENR & R in 2030 and 2035

Final or available¹⁷ energy is the energy delivered to the consumer for final consumption (petrol at the pump, household electricity, etc.).

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

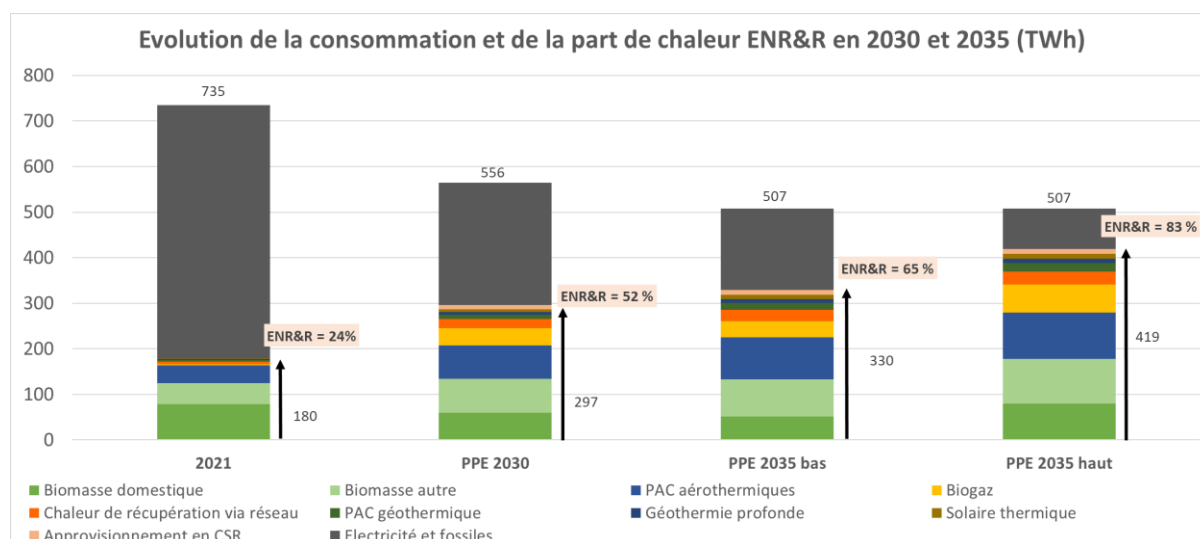


Figure 19: Evolution of the share of heat ENR & R in 2030 and 2035

To support this increase in renewable heat consumption, all renewable heat production pathways are being called upon, as well as increased use of waste heat recovery. EPP 3 thus 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 represent 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

Table 7: Heat production targets by sector

It is stressed that biomass consumption and production figures are being modelled in the process of being finalised as part of the preparation of the SNBC, which may lead to a revision of the above trajectories.

In order to develop renewable heat, the government has four main, widely tested devices:

- 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.

Set up in 2009, the Heat Fund, managed by ADEME, enabled the massive deployment of renewable heat production installations on French territory. During this period, this investment aid supported more than 7100 projects amounting to EUR 3,68 billion of aid out of EUR 12,4 billion of investment and an annual production of 42.6 TWh of ENR & R heat. Increased by 40 % in March 2022, to reach EUR 520 million over the whole of 2022, it will be increased again in 2024 to EUR 820 million.

District 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 through stable heat prices over the long term, while facilitating the transition from fossil fuels 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, 60 % of which ENR & R heat in 2021 to 68 TWh, of which 75 % is ENR & R heat in 2030 and then up to 90 TWh, 80 % of which is ENR & R heat in 2035 (Figure 29).

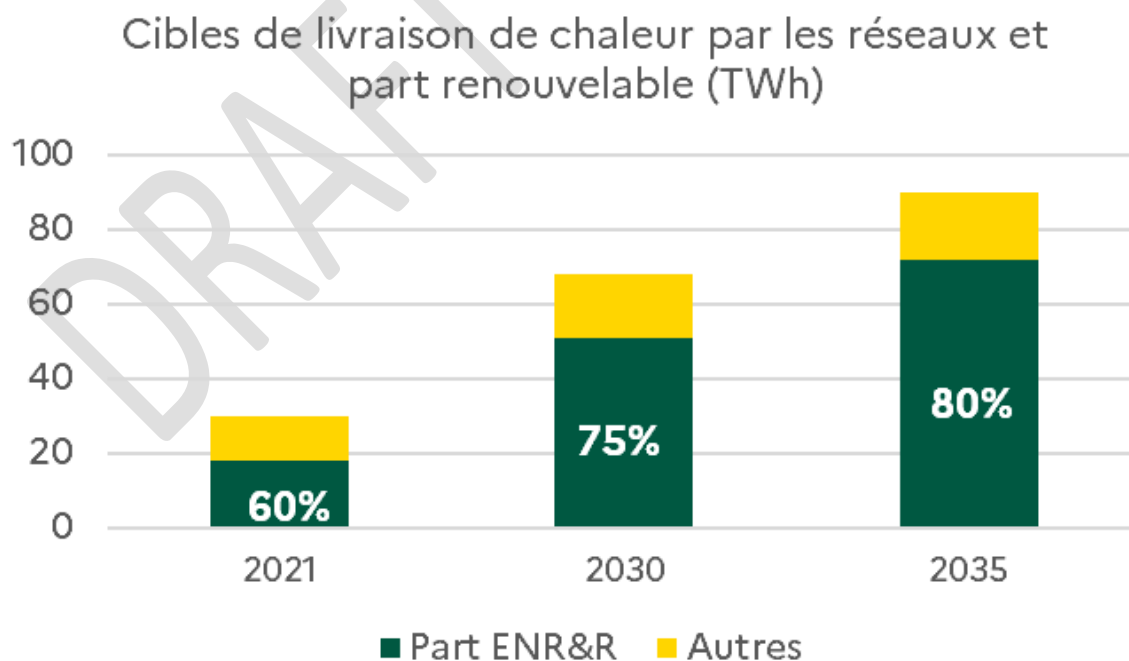


Figure 20: Delivery to district heating networks ENR & R in 2030 and 2035

This level of delivery requires connecting between 300 000 and 360 000 dwellings on average per year until 2035. This represents between 5,8 and 6,7 million houses connected in 2035, compared to less than 1,3 million in 2020. In the vast majority of cases, these connections will concern collective residential housing with collective heating, but, to a significant extent, this may be an alternative to individual fossil heating through the creation of a secondary water loop in the home.

Biogas

As of 23 October 2023, 617 installations injected biomethane into natural gas networks. Their capacity amounts to 11.1 TWh/year, 22 % more than at 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 a fraction of at least 15 % of biogas injected into gas networks) and a moderate increase in the amount of biogas used for cogeneration and heat production of electricity. The development of biomethane would be mainly driven by the development of intermediate energy crops (CIVE) and the mobilisation of livestock manure. It is worth highlighting the importance of developing intermediate crops between main crops with an agro-ecological objective, as well as better valorisation of existing livestock manure, reducing GHG emissions (methane), improving nitrogen management in agriculture and reducing 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 increase production such as pyrogasification, hydrothermal gasification or methane, which are currently subject to demonstrators.

It is stressed that biomass consumption and production figures are being modelled in the process of being finalised as part of the preparation of the SNBC, which may lead to a revision of the above trajectories.

Support for methanisation is now largely supported by budgetary financing and is intended to evolve, as a result of the Resilience Climate Law, towards a system of compulsory incorporation based on marketing companies. 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, well positioned on the sector, while fossil gas is imported and therefore degraded the French and European trade balance, presenting climate challenges and energy sovereignty.

Hydrogen

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

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

- switch the production of substitutable fossil hydrogen to decarbonised production of approximately 430 kilotonnes of hydrogen out of 900 kilotonnes of hydrogen¹⁸;
- meeting the decarbonised hydrogen needs of new uses by prioritising them (industrial or heavy mobility) in view of the large amount of electricity generated by electrolysis.

France adopted an ambitious strategy in 2020 to accelerate the deployment of hydrogen production by electrolysis and its use. The recovery plan and the French 2030 investment plan made hydrogen and its technologies a pillar of the French green and industrial recovery. The government is

¹⁸ Part of the hydrogen is inherent in the refining process and self-consumed at the sites. The exit from fossil fuels will mean ending this fossil hydrogen production.

committing almost EUR 9 billion by 2030, with a dual objective of technological development and the green transition.

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 develop a pathway of excellence.

Following several consultations with all stakeholders, an updated French hydrogen strategy will be published by the end of 2023.

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

This production will be supplied by the French decarbonised electricity mix or dedicated renewable electricity production 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 hubs 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 widespread activity, limited to special use cases or the need for a network 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. Beyond these priority hydrogen hubs, local territorial deployments will be consistent with the needs of heavy mobility.

- **Strengthening control of the hydrogen value chain 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 supply chain coverage.

- **Consolidating an international hydrogen strategy:**

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

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

At the same time, in order to meet all future hydrogen needs in the context of a forced electrical loop by 2030, we will need to anticipate our post-2030 hydrogen import structures (or its derived products) already now. This includes, in particular, a more detailed assessment in the context of the new strategy of the needs of domestic versus imported hydrogen, the necessary infrastructure and associated business models.

Biofuels and synthetic fuels

Currently, the consumption of biofuels mainly comes from first-generation (so-called 1G) biofuels, 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, the use of these first-generation biofuels is capped at 7 % by European legislation. The

production of first-generation biofuels is integrated into the French agricultural/agri-food sectors, enabling the production of co-products that are valued in livestock farming and ensures the agility of businesses in highly competitive global food markets, particularly sugar, thanks to the substitutability of uses.

The current challenge is therefore to develop the production of ‘advanced’ biofuels, mainly from co-products, residues and waste that do not compete with food or form part of sustainable forest management. Biofuels will accompany the decarbonisation trajectory 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 waterways (regional passenger and freight mobility).

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

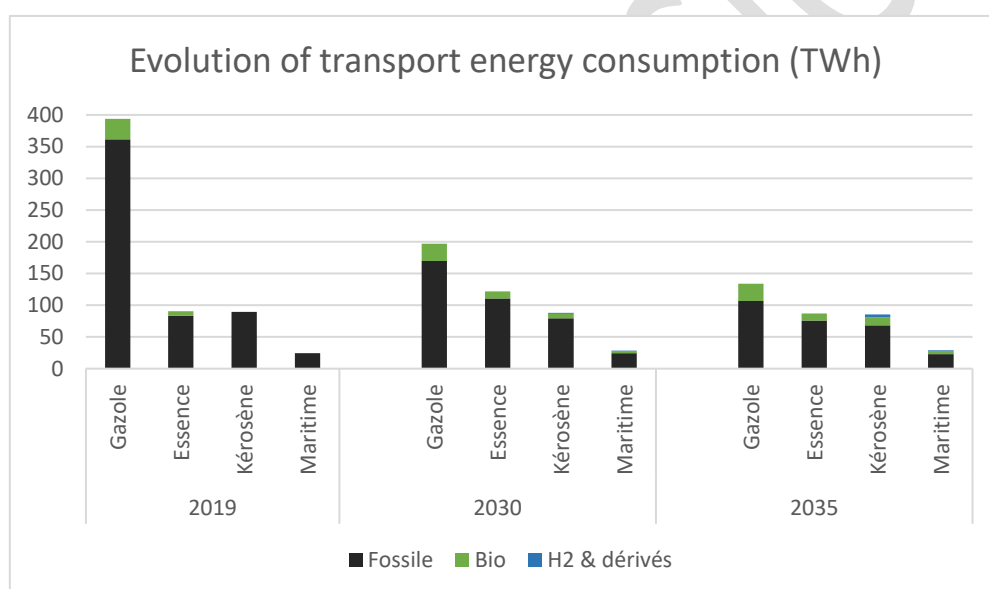


Figure 21: Evolution of transport energy consumption (in TWh). As the 2021 consumption data are affected by the COVID crisis, 2019 is taken as a reference.

In 2030, the estimated need for biofuels and bioliquids is 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 a continued volume of 2030 for land-based biofuels (with the incorporation rate increasing at the same time as consumption falls), non-energy use and overseas electricity production, 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 at present, it will be partly based on imports of raw materials from the sector, the sustainability of which is traceable and secure (particularly for waste oils). France has set up a register for monitoring all sustainability certificates (carbide) and strengthens the requirements for recognition of double counting, in order to improve product traceability.

It is stressed that biomass consumption and production figures are being modelled in the process of being finalised as part of the preparation of the SNBC, which may 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 not to pay this tax once the target is met. In order to value biofuels with the highest greenhouse gas savings, TIRUERT will set greenhouse gas emission reduction targets, in the form of a carbon content per MWh of energy used in the well-to-wheel transport sector in addition to a renewable energy incorporation rate.

A target for the use of renewable energy by fuel will also be imposed in addition to ensure the contribution of these sectors to the reduction of GHG emissions, in line with the structure of the RED3 targets.

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 emissions reduction trajectory would be as follows.

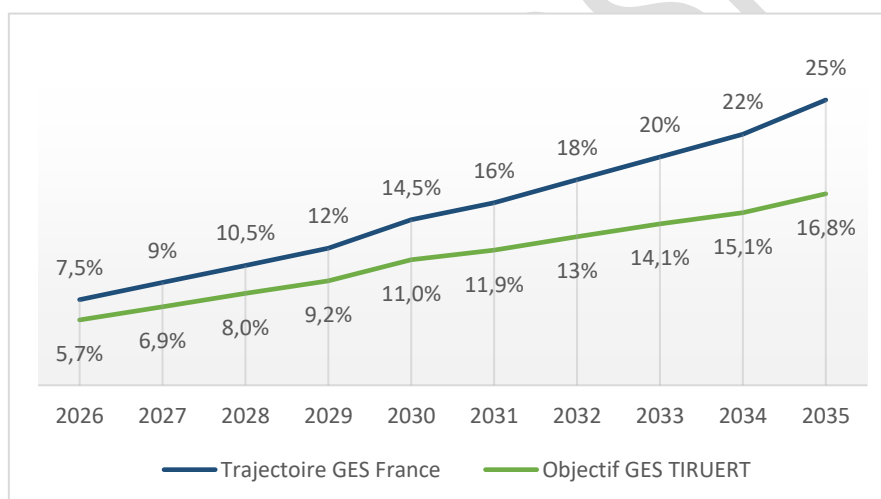


Figure 22: National trajectory and TIRUERT to reduce GHG emissions from energy used in transport.

This trajectory is based in particular on an evolution of 1028 % of electric vehicle charging on the public grid and an evolution of 2534.5 %¹⁹ of renewable electricity in the electricity mix in 2030 and 40 % in 2035.

Tiruert Aviation will also be reviewed to take account of the provisions of the Refuel Aviation Regulation and to provide for their proper articulation with the RED III Directive.

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

RES consumption in industry:

¹⁹ Working hypothesis for SFEC, indicated on page 24 of the SGPE presentation on Ecological Planning in Energy, 12 June 2023

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

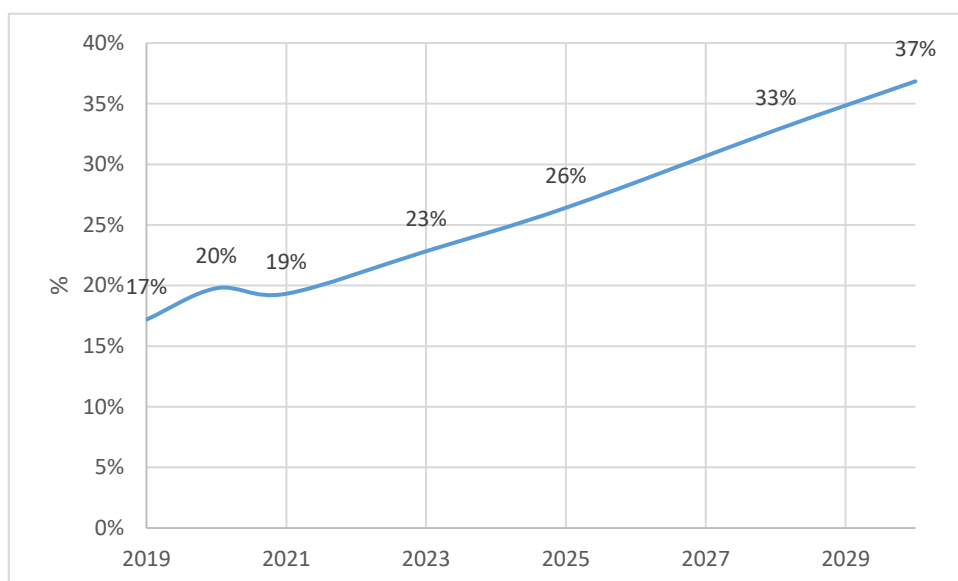


Figure 23: Part of EnR in final consumption for industrial energy

IV **Biomass as a key enabler for decarbonising the economy**

Biomass is a crucial vehicle for decarbonising the economy, but its use for energy purposes raises the crucial question of matching “supply” and “demand” in both quantity and kind (vector: solid, liquid, gaseous), which refers to the issue of prioritisation of uses and autonomy of biomass supply.

This challenge is reinforced by the fact that, despite the ‘limited’ nature **of the resource, it seems reasonable, given France’s potential for biomass production (1th agricultural^{area} (UAA) and 4th EU forest^{area}), to seek an overall balance between supply and domestic demand for biomass in 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 follows on from precedents and **supports the assumption of a foreseeable increase in biomass consumption for energy purposes in a context of decarbonisation of all sectors of the economy,** and the limited possibility of using other carriers, in particular electricity, for all energy consumption.

Faced with this foreseeable increase in biomass consumption, a first challenge is to **deploy measures, tailored to each sector, allowing greater mobilisation 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 foresees an **increased production of biomass for energy purposes of 228 TWh Ef PCI by 2030, compared to 209 TWh Ef PCI in a trend**

scenario, as illustrated in the following figure²⁰. **This development is based both on improved collection arrangements and on significant changes in cultivation practices and/or areas concerned**, reflected in the assumptions of the SNBC 3 interim baseline scenario and the guidelines and levers of this strategy.

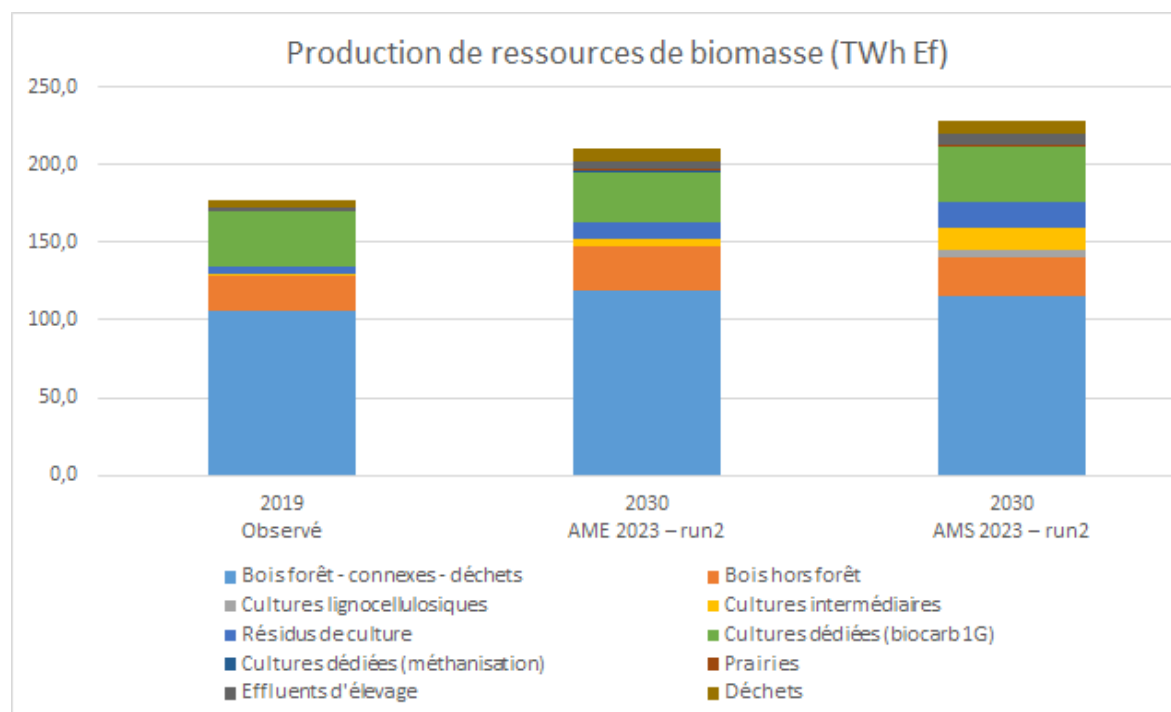


Figure 24: Evolution of biomass resource production between the trend scenario (AME) and the SNBC 3 interim reference scenario (AMS) by 2030

The increase in the need for biomass resources **must also be part of a sustainability approach**. The environmental framework for cultivation practices or biomass harvesting and management must be clear and transparent and based on the latest available scientific knowledge²¹. **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**, pointing out that biomass used for energy is often a co-product or residues of other biomass producing activities, often has a strong territorial component and that, as regards forest biomass, it already benefits from a national framework (Forest 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. It is ensured that land use is closed, in particular to ensure that agricultural biomass is not produced at the expense of grassland or afforestation. In

²⁰ A **significant effort has 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 Ef between 2019 and 2030). With regard to woody biomass, the main quantitative gain would be expected on the mobilisation of primary biomass and related ones linked to increased harvesting (+ 9 TWh between 2019 and 2030) and on end-of-life wood waste (+ 3 TWh Ef between 2019 and 2030).

²¹ To this end, a bibliographic summary of INRAE, completed in 2023, provides the **basis for reflection on potential environmental impacts and identifies the knowledge to be strengthened**.

particular on forests, the availability of energy wood is directly linked to the timber harvesting needed to decarbonise the rest of the economy, and the share of timber harvesting 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 reduction of 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, total final energy consumption of biomass could amount to **235 TWh in 2030 under the baseline scenario (compared to 186 TWh in 2030 under the trend scenario)** for an estimated output of 228 TWh Ef PCI. The provisional version of the baseline scenario thus points to a **slight imbalance in biomass demand in 2030**. Moreover, uncertainties about the **projected figures suggest caution as early as 2025**, as consumption in several sub-sectors may be revised upwards.

Increased mobilisation cannot, therefore, fully address the issue of matching supply and demand for biomass, especially at more distant 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.

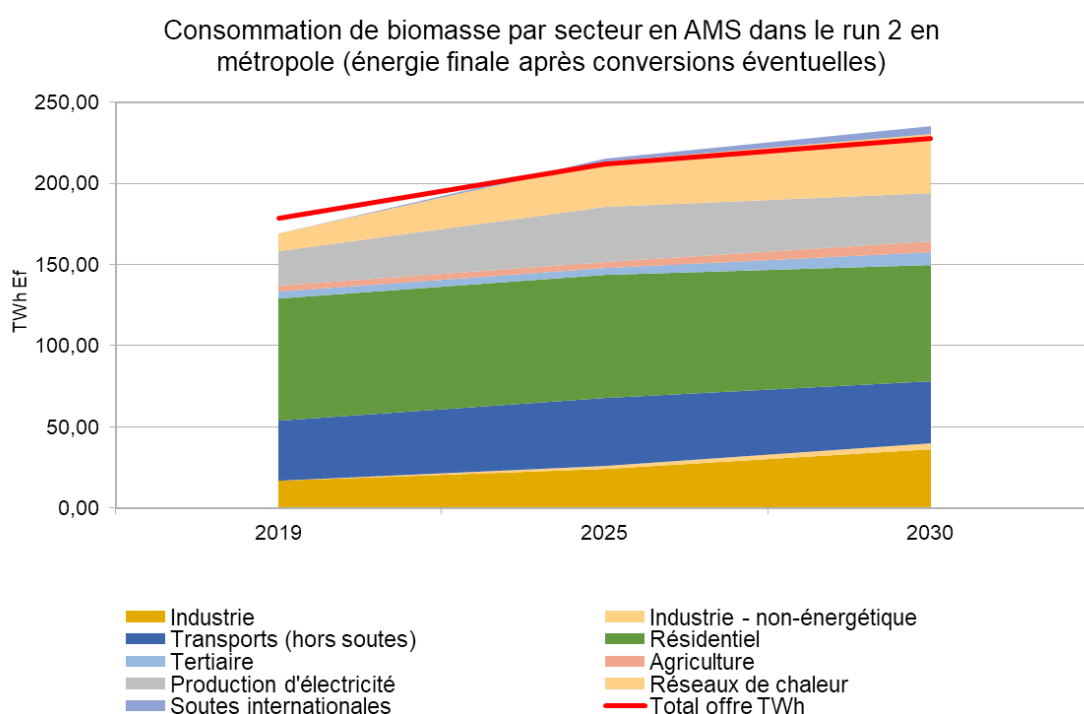


Figure 25: Biomass consumption by sector in current modelling of the SNBC 3 interim baseline scenario

In addition to the 'quantity' issues, the **question of supply-demand adequacy also arises with regard to the solid/liquid/gaseous nature of the energy carriers used**.

These findings call for strategic choices on prioritising certain uses and taking into account the specific characteristics of each type of biomass. A third iteration of the baseline scenario **will need to include additional demand moderation measures compared to this interim scenario to ensure supply / demand closure by 2030 and beyond**.

Demand moderation will primarily involve **strategic choices to prioritise uses at least as a priority**, relying in particular on the availability of biomass energy alternatives for certain uses (example: the

increased use of heat pumps or geothermal heating for certain residential or tertiary buildings), as illustrated in the following figure. **Moderating biomass demand is also in line with the challenge of reducing energy consumption overall.** A priority for the resource has been established: it prioritises, among energy uses, those which do not have a better alternative, in particular to produce high-temperature heat in industry.

These strategic choices (which are intended to be confirmed and refined by the final version of SNBC 3) to prioritise uses are reflected in the assumptions of the provisional baseline scenario.

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

- Finely and regularly updated estimates of the available or potential resource, including by incorporating uncertainties related to the impacts of climate change; and ensure the sustainable management of the resource in order to have an 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 projected;
- Ensure overall consistency of the projects supported throughout the territory with this strategy and with the balances and priorities defined at national level.

As such, the question of data and its accessibility, and the related legal framework, has already been identified as a key issue. The 'regional biomass cells' are currently responsible for checking that the supply of locally available biomass is matched at regional level with the needs of the various projects, in line with the prioritisation of uses. The role of government departments and public institutions, and in particular that of the "regional biomass cells", will require legal consolidation and access to data, ensuring the involvement of stakeholders. This will meet the new European requirements on the principle of cascading use of woody biomass, prior to energy recovery, imposed by the European RED, in line with the national hierarchy of uses.

2.2. Energy efficiency dimension

In view of the date of publication of the Energy Efficiency Directive (EU) 2023/1791, the data in this paragraph will be supplemented or even modulated in the final version of the INECP to be sent to the European Commission in June 2024.

2.2.1. Elements set out in Article 4 of Directive 2013/1791/EU

National energy consumption reduction

Article 4 of Directive (EU) 2023/1791 on energy efficiency sets a European 2030 target of a maximum final energy consumption of 763 Mtoe and 992,5 Mtoe of primary energy. Those targets shall aim to reduce energy consumption by at least 11.7 % in 2030 compared to the projections of the 2020 Union Reference Scenario.

France sets a target of a 30 % reduction in final energy consumption in 2030 compared to 2012, which is reflected in the following consumption by 2030:

- final energy consumption: 1 209 TWh (104,0 Mtoe)
- primary energy consumption: 1 829 TWh (157,3 Mtoe)

The trajectories modelled at this stage lead to France's final energy consumption in 2030 of 1 371 TWh, which would require an additional effort to secure France's target of 1 209 TWh. These models incorporate a reindustrialisation scenario, which reduces the French and European carbon footprint, but also mechanically increases energy consumption on national territory, by around 50 TWh. France's reindustrialisation is positive on employment but also on climate, as the electricity mix in France is largely decarbonised.

The modelling exercise is an iterative work, consisting of identifying concrete measures sector by sector, determining their impact on consumption, comparing them with the overall target objective and then resuming if the latter is not met.

New levers to keep the target of a 30 % reduction in energy consumption in France in 2030 compared to 2012 will therefore be identified, and will be presented in the final version of the update of the PNIEC. They will concern:

- energy sobriety: the aim is to reduce energy consumption through changes in lifestyles and social transformations, by rethinking needs. (Examples: use soft modes of transport such as cycling or walking rather than by car for short distances or lower heating temperatures, encourage teleworking, densify collective transport routes to limit distances);
- energy efficiency: obtain the same service with minimised energy consumption. (Example: replace luminaires with LEDs).

In this spirit of seeking additional measures, the French authorities foresee that the principles of sobriety and energy efficiency will be taken into account from the design of a plan or programme, a law, a project or a major investment decision. In addition to sobriety and the shift in consumption patterns towards less energy intensive uses, the main lever identified at the time is based on accelerating the electrification of certain uses (heat in buildings, electrification of transport) which allows for intrinsic energy efficiency by improving overall efficiency. Historically, these trajectories have been faster than expected, reflecting changes in household choices.

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 saving obligation levels for the period 2021-2030 at the following pace (% of France's final energy consumption in the reference period 2016-2018):

- 2021-2023: 0.8 %, i.e. 13.5 TWh/year;
- 2024-2025: 1.3 % or 22 TWh/year;
- 2026-2027: 1.5 % or 25 TWh/year;
- 2028-2030: 1.9 %, i.e. 32 TWh/year.

Thus, the amount of energy to be saved over the period 2021-2030 from the average final energy consumption 2016-2018 (1 649.35 TWh, source SDES) is given by the following table:

EEC projections (TWh)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	13,2	26,4	39,6	61,0	82,5	107,2	131,9	163,3	194,6	226,0

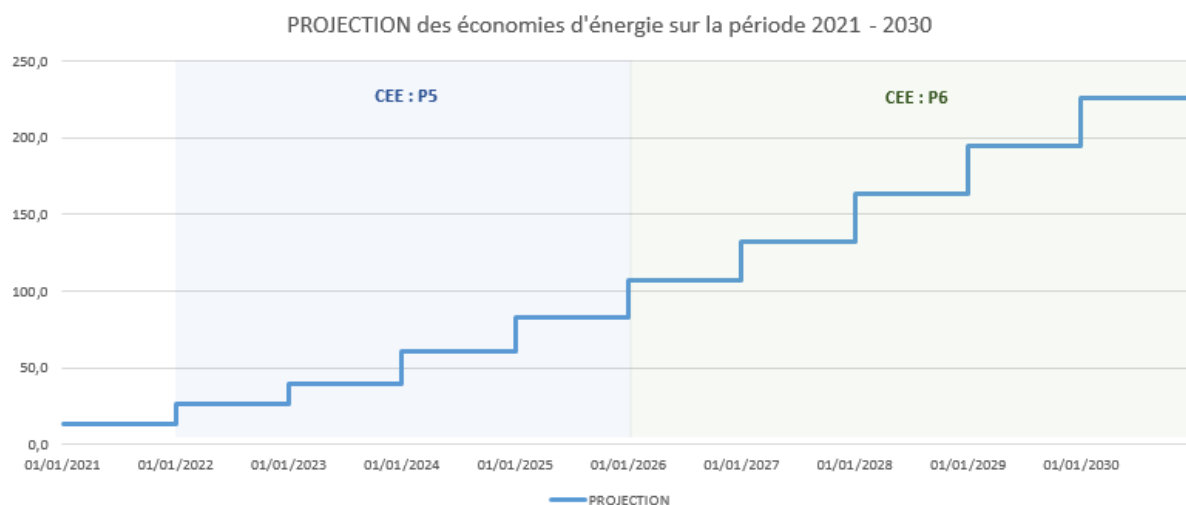


Figure 27: Projections of energy saving bonds acquired under Article 8 EED (2023/1791/EU) over the period 2021-2030

The target for the period 2021-2030 would therefore be 1 046 TWh, or 89 940 ktoe.

Under Article 8 of Directive (EU) 2023/1791, France will use the obligation for energy sellers to justify energy saving operations via the energy savings certificates scheme.

Energy poverty

Law No 2010-788 of 12 July 2010 on a national commitment to the environment (Grenelle II) introduced the concept of energy poverty in French legislation. Thus, a person in energy poverty is 'a person who has particular difficulties in obtaining the energy supply necessary to meet his basic needs as a result of the inadequacy of his or her resources or habitat conditions'.

In order for households in energy poverty to be preferred targets for reducing energy consumption, the Energy Saving Certification (EWC) scheme requires energy suppliers to carry out a certain volume of energy-saving operations in households in energy poverty since 2016. In 5th EEC period 2022-2025, the share of energy poverty certificates (1 130 TWhc) corresponds to 36 % of the total bond level (3 100 TWhc).

2.2.3. Elements set out in Articles 5 and 6 of Directive 2013/1791/EU

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

Reduction of energy consumption by public bodies

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

RRenovation of buildings owned by public bodies

In the baseline 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 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.

In order to comply with Article 6 of Directive (EU) 2023/1791, which requires a renovation of 3 % of the heated or cooled area of buildings owned by public bodies, France plans to set renovation trajectories, which will be specified in the final version of the update of the French NECP. France must decide by the end of the year on the activation of the alternative measure provided for in this Article.

France sent in March 2020 its long-term strategy to mobilise investments in the renovation of the national stock of residential and commercial, public and private buildings. This document was drawn up in the context 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 put in place minimum energy performance standards aimed at gradually banning the most consumer dwellings from renting. Thus, the maximum final energy consumption threshold for a dwelling has been set at 450 kWh/m² since 1 January 2023 for hexagonal France. The Climate and Resilience Law, adopted in 2021, strengthened this provision. Thus, from 2025, it will be forbidden to rent heat passoires classified as a G label for the purposes of the assessment of energetic performance, and from 2028 for the rest of the passoires classified as F. A from 2034, it will be the dwellings classified as E (addition voted by the national representation) that will be prohibited from renting.

Indeed, these dwellings will gradually be considered to be indecent from the point of view of the law. The dwellings will therefore no longer be rented out and the current tenant, for example in the event of tacit renewal of the lease, may require the owner to carry out work.

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

For existing buildings, the definition of nearly zero-energy buildings corresponds to the BBC Renovation label.

The national targets for energy demand management are:

- A 50 % decrease in final energy consumption in 2050 compared to 2012 (as defined in the Energy Transition for Green Growth Law and the Energy and Climate Law);
- The draft multiannual energy programming also includes sectoral energy consumption reduction targets. All the measures envisaged are detailed in section 3.2.

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

France also set in 2019 a target for ending the sale of new heavy-duty vehicles used for the transport of persons or goods using mainly 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 green planning work, the French authorities also envisage targets of 66 % of electric cars, 51 % of light electric vehicles, and 50 % of electric heavy-duty vehicles in new sales in 2030.

2.3. Dimension energy security

The war in Ukraine and the consequent decrease or even halted imports of Russian pipeline gas and petroleum products have 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 on a permanent basis, and the absolute priority for the EU to exit fossil fuels.

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

This situation necessitated a short-term strengthening of import and storage capacity, but in a reasoned manner in order 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 significant reduction in gas consumption in France caused by the introduction of a large 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 context of natural gas supply.

On electricity consumption, EPP 3 will focus on exploring and fostering the resilience of our electricity system based on stress tests. It will also pursue the objective of controlling consumption at the forefront and developing the flexibility mix available, in particular: batteries, pumped power transfer stations, demand-side response 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), the measures to ensure the security of supply of fuels will evolve and take account of new products.

Strategic stocks of crude fuels and 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, domestic fuel 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 the decrease in diesel consumption towards petrol

or the increase in the consumption of biofuels, with a view to maintaining the resilience of this national energy logistics.

2.3.2. Security of gas supply

France has import capacity via the Franpipe pipeline, which connects natural gas production fields located in the Norwegian North Sea to France, and 4 LNG terminals (located in Dunkerque, Montola de Brittany, and two of them to Fos-sur-Mer) allowing 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 natural gas consumption, and 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

Further information may be provided during the update of the PNIEC in 2024.

On demand reduction plans:

France published energy sobriety²² plans on 6 October 2022 and²³ 20 February 2023 and recently on 12 October 2023 in order to keep our energy consumption down over time and, in particular, to achieve the 15 % reduction in gas demand. More details on these sobriety plans can be found in section 2.3.3 below.

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

France makes the exit of fossil fuels a priority. This is done through four pillars: energy sobriety, energy efficiency, acceleration of all renewable energies and the revival of nuclear power. The EPP defines state action over the next decade to reduce energy consumption in all sectors and decarbonise the energy mix.

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

On the level of gas storage of at least 80 % on 1 November 2022, rising 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 will be checked and updated when the INECP is updated in 2024 on the basis of feedback from experiences.

²² https://www.ecologie.gouv.fr/sites/default/files/Plan_Sobriete_energetique_un%20an%20apres.pdf

²³ <https://www.ecologie.gouv.fr/sites/default/files/dp-plan-sobriete.pdf>

2.3.3. Security of electricity supply

The main challenge is the dimensioning of the electricity system to cover annual energy needs and the passage of peak power consumption and decarbonisation.

The switch from peak power is primarily based on the flexibility of the electricity system. Thermal capacities, batteries, pumped power transfer stations, contractually controlled demand management and interconnections provide a complete mix of flexibilities.

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 priority, and exclusively for coal-fired power plants, switching to decarbonised fuels (biomass, biogas or hydrogen);
- Where this is not possible, in case of 'incompressible' 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 Forecast Review 2023-2035 published on 20 September 2023²⁴ contains in-depth analyses of the flexibility needs over time of the multiannual energy programming. 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 ensure the need for flexibility by 2030 and thus identified a need for additional capacity that could be met by different combinations of consumption and production management.

Demand flexibility (demand-side response, charging control, peak electrolyser consumption modulation) and batteries can meet, in addition to or as an alternative, balancing needs over a few hours. For longer periods, the need to keep the last two remaining coal-fired power plants in operation by converting them to biomass and the development of additional decarbonised thermal capacities will depend to a large extent on the level of nuclear availability, as well as additional efforts on sobriety.

In any case, RTE concludes that, should the need for thermal capacity be proven, it would be limited, would cover a low volume of hours on average, and could be covered without building new fossil power plants, adapting the current fleet.

In order to ensure security of supply and optimise the operation of the electricity system by 2030 and 2035, developing demand flexibility as a whole and electricity storage batteries is a priority axis. The aim is to have a minimum flexibility base consisting of explicit and implicit demand response, battery electricity storage, modulation of charging of electric vehicles, and generally modulations of electricity consumption, including structural variations.

In order to meet the needs of the electricity system in 2030 and 2035, flexibilities must be developed in such a way as to modulate, simultaneously or not, the national load curve for a cumulative effect of:

- 25 GW in 2030;
- 35 GW in 2035.

²⁴<https://www.rte-france.com/actualites/bilan-previsionnel-transformation-systeme-electrique-2023-2035>

The assessment of the effect on the national load curve will be monitored and steered regularly. The contribution of the various sectors and the indicators of this monitoring may be specified in the multiannual forecast balance referred to in Article L. 141-8 of the Energy Code.

The objectives relating to the flexibilities and the future of the thermal park will be the subject of further analyses on the basis of RTE's forecast balance sheet and may be specified in the final version of the update of the INECP.

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

The next EPP will set more ambitious targets for reducing our energy consumption: 1 209 TWh (a reduction of 30 % compared to 2012) in 2030 compared to a target of 1 378 TWh (i.e. a reduction of 16.5 % compared to 2012) in 2028 in the previous EPP.

France published energy sobriety plans on 6 October 2022, 20 February 2023 and 12 October in order to record the long-term decline in our energy consumption. The aim is to make consumption cuts sustainable in order to keep the target of -10 % in 2024. The good performance in terms of consumption declines seems to persist in various sectors, as confirmed for example by the ENEDIS analysis published on 19 July on the decline in consumption of street lighting in 2022-23 beyond the winter period, or the 9 % decrease observed between April and July 2023 compared to the same period in 2019.

To move further towards a sobriety in everyone's daily lives, five new announcements were unveiled on Thursday 12 October²⁵ by the Minister for Energy Transition Agnès Pannier-Runacher following a dedicated colloquium on:

- Continue to mobilise the large French companies by involving the 120 largest companies (those registered in SBF 120),
- Enable French people to better steer their energy consumption with a thermostat plan, as a programmable thermostat allows 15 % energy savings;
- Regulating and clarifying the rules on light pollution in showcases and offices,
- Promoting in-house mobility, in addition to the EUR 100 carpooling boost launched in 2023, which already affects 160 000 drivers,
- Offer offers to enhance energy savings and reduce bills in relation to energy suppliers (e.g. peak-to-mobile offers or "sobriety bonus").

The final version of the NECP may add to the reduction of electricity consumption by 10 % compared to the reference period and a 5 % reduction in power consumption during peak hours.

²⁵ https://www.ecologie.gouv.fr/sites/default/files/Plan_Sobriete_energetique_un%20an%20apres.pdf

2.4. Dimension internal energy market

2.4.1. *Energy infrastructure*

2.4.1.1. Power grids

The challenges of accelerating and massification of renewable energy, as well as increasing consumption, especially in industry with high new needs for, inter alia, large sites and ports in the context of charging large hybrid powered vessels such as ferries, will entail structural changes in network development strategies and associated investments.

The challenges are both financial, with steadily increasing investment paths in the coming years, and industrial (availability of equipment, challenge of connecting offshore wind, standardisation/massification, scaling up of industrial tools) and human (recruitment).

The TEN transmission system operator is currently reviewing its trajectories to take into account the context of accelerating the energy transition. These new trajectories will be presented in its ten-year transmission network development plan to be published in 2024. In particular, they will include the challenge of speeding 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 a key challenge for the success of the energy transition. This is why the legislative framework has evolved with the Renewable Energy Acceleration Law to facilitate this anticipation of investments by grid operators and to strengthen existing planning tools.

Smart grids

Smart grid 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 functioning 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 more detailed knowledge of constraints and the possibility of remote control of many network elements, they can steer the network as close as possible to its limits, make it more resilient to hazards – for example by self-healing incidents – and avoid costly investments. Optimising flows also reduces grid losses, which today account for 8 % of electricity consumption.

They shall also promote the optimisation of the production stock in order to avoid investing in new carbon production capacity, allowing the steering of renewable production where possible, and to exploit new sources of flexibility through storage. Finally, they allow for a coherent deployment of demand-side flexibilities, by steering the charging of electric vehicles or optimising consumption.

Smart meters

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

The investment of around EUR 5 billion is supported by distribution system operators through the TURPE. To date, more than 36 million low-voltage customers are equipped with a Linky communicator and are already benefiting from the associated new services. The deployment and budget targets have been met, allowing a positive assessment of the achievement of community-based gains, with EUR 1 billion saved over the period 2021-2024.

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

- a much more refined 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 network by making it possible to significantly increase the observability of the low-voltage network for system operators, including closer monitoring of the voltage level on the low-voltage network, as well as faster detection of faults and power faults.

The meter promotes the emergence of consumption control services, for which it will support. It also allows for the deployment of new tariff mechanisms, which make it possible to better reveal the costs of the electricity system and provide the right incentives, both in terms of transmission tariffs (TURPE) and 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 the DGEC in 2022 to identify the challenges associated with gas infrastructure in a context of declining methane gas consumption. This study will be complemented by the end of 2023 with a financial trajectory based 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, with few pipelines that 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 are few possibilities to significantly reduce the costs of using natural gas distribution networks by 2030, although adjustments can be made and need to be planned, especially in priority heating network deployment areas.

2.4.1.3. Oil logistics

Oil logistics will evolve to accompany the energy transition: evolution of refining to ensure the production of alternative fuels and to reduce the use of fossil energy in processes, evolution of depots to absorb a larger share of biofuels, change in the business model of service stations as a result of changing uses while maintaining a sufficient network of service stations to avoid the creation of white areas. Monitoring the density of the mesh size at service stations is part of the EPP provisions.

2.4.1.4. Hydrogen infrastructure

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

In order to meet all future hydrogen needs, we need to anticipate our post-2030 hydrogen import structures (or its derived products) already now. This means assessing in the context of the new strategy the needs of domestic versus imported hydrogen, the necessary infrastructure and associated business models.

2.4.2. Energy market

The current European electricity market framework 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 operating power plant. It continuously ensures efficient dispatch of installations across Europe at the lowest 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 allow the emergence of a long-term price signal needed for consumers to invest in electrification of uses, efficiency and sobriety. Electricity market rules therefore need to be complemented in order to enable 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 Regulated Access to Historical Nuclear Power (ARENH) will come to an end on 31 December 2025. It is therefore important that the future organisation of the French electricity market enables 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) goes 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 in the multiannual energy planning the trajectories of the decarbonised energy production stock.

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

2.4.3. Energy poverty

The new Social Climate Fund (SCF) created to mitigate the social impact of the creation of the new European carbon market on the road transport and buildings sectors aims to reduce the dependence on fossil fuels of the most vulnerable households exposed to energy poverty or particularly exposed TSEs, while contributing to greenhouse gas emission reduction targets in these sectors. France has initiated the work on preparing its future Social Climate Plan, which it will have to submit to the Commission by June 2025 at the latest, in line with its updated National Energy Climate Plan.

According to the Law of 12 July 2010 on a national commitment to the environment, ‘*a person experiencing particular difficulties in obtaining the energy supply necessary to meet his basic needs in his home owing to the inadequacy of his resources or housing conditions is in a situation of energy poverty*’.

The National Observatory for Energy Precarity has become a reliable and shared reference tool on energy poverty in France, for knowing, monitoring and analysing this phenomenon and on the arrangements 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 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 Commissariat général for Sustainable Development using the Prometheus microsimulation model. This indicator considers a household in energy poverty when its energy expenditure in its dwelling exceeds 8 % of its income, and its income per consumption unit (UC) is less than 3 decimal^{places} of income per UC. The share of households in energy poverty is estimated annually by the Commissariat Général for Sustainable Development (CGDD) using the 'Prometheus' model;
- the indicator on the feeling of cold, taken from the Energie-info barometer produced by the National Energy Ombudsman with a sample of more than 2000 people. This reporting indicator makes it possible to quantify the self-restriction phenomena that the economic indicator does not capture. This indicator considers a household in energy poverty if it reports cold for at least one of the following five reasons: poor insulation, insufficient heating installation, heating failure, limitation of heating due to cost, power cut due to unpaid energy.

According to the National Energy Poverty Observatory (ONPE), in 2021, 11.9 %²⁶ of French households, or 3,4 million households (compared to 3 million in 2020), spent more than 8 % of their income on paying their housing energy bills (compared to 10.5 % in 2020 and 11.4 % in 2019). The 'weather corrected' indicator, which neutralises the effect of weather on heating consumption, stands 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:

²⁶Gross indicator, uncorrected for weather

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

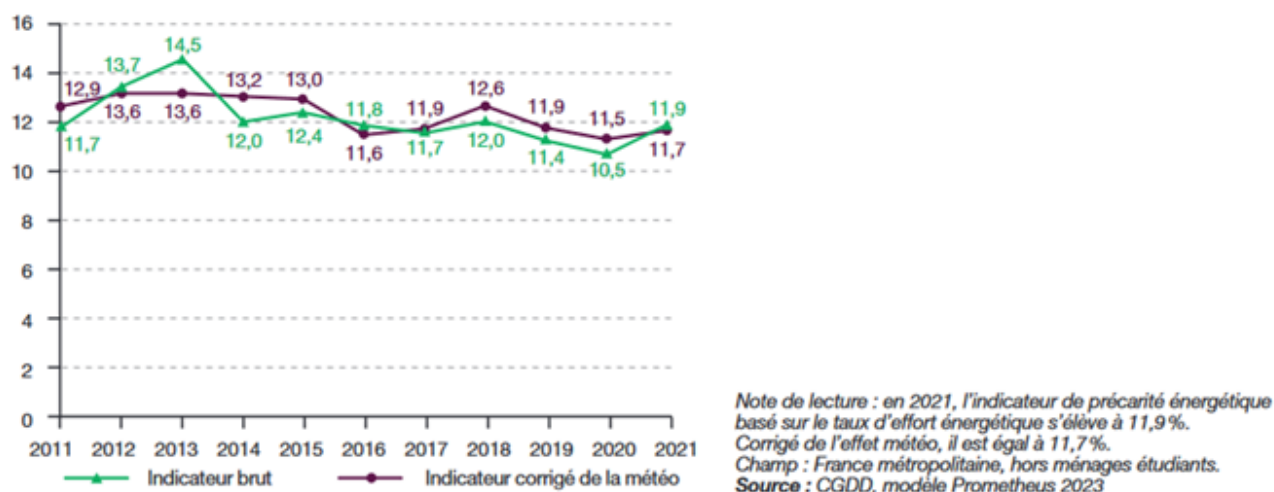


Figure 28: Evolution of the energy poverty indicator based on the energy effort rate

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

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

Preventive measures

Energy renovation

Several support schemes for energy renovation have a particular focus on the smallest households:

- The Energy Saving Certificates scheme requires energy suppliers to finance a certain amount of energy renovation works in French households, some of which are energy poor households. From 2016, when the 'energy precarity' obligation was created, to 2022, around EUR 6,7 billion of works²⁷ were financed under energy poverty EWCs, of which 23 % have been financed since the beginning of 2022. Within the energy sobriety plan, the level of obligation for EWCs increased by 25 % for the 5th period 2022-2025.
- In 2022, almost 70 % of the projects financed by the MaPrimeRénov' aid (grants for private individuals to finance energy renovation projects – insulation, changing the heating system, installing ventilation, carrying out an energy audit – including accompanied global renovations) concerned low-income households, out of a total budget of EUR 3 billion. The strengthening of the French Rénov' advisory network and the development of 'Rénov' accompanying persons will make it possible to improve advice for all households, particularly those leading to major renovations.

²⁷1358 energy poverty TWhcumac registered in the national register of EWCs.

The term cumac (for cumulative and updated purposes) 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 is equivalent to the residential energy consumption of one million French people for 15 years.

- In order to better finance the rest and make it easier for households to access bank loans, in addition to existing tools such as the zero-interest eco-loan (ecoPTZ), the Renovation Advance Loan is a tool created in March 2022, which makes it possible to repay the remainder at a later stage, for example on the sale of the dwelling or as part of a succession, with a public guarantee of 75 % of any loss incurred.

Tariff shields

During the energy price crisis, tariff shields were put in place to protect households from unprecedented increases in energy prices:

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

Winter truce and minimum electricity supply service

During the winter truce, between¹ November and 31 March, energy suppliers are under an obligation to maintain the supply of natural gas and electricity to their unpaid customers. On the other hand, electrical power may be reduced, except for those entitled to the power voucher. Apart from the winter truce, if an interruption of supply is envisaged, its implementation is subject to strict rules for all households (relaunch letters, deadlines, information to the social services by the supplier where the feed has not been restored within five days of the outage).

In addition, since 1^{April} 2023²⁸, a minimum 60-day electricity supply period has been put in place for beneficiaries of the energy voucher and the housing solidarity fund, prior to any cuts in the event of unpaid payments. During this period, the electricity supply is maintained at 1 kVA, allowing the consumer and the supplier time to find a solution to the household situation.

Curative measures

Assistance in the payment of invoices: the energy voucher

The energy voucher, which was generalised in 2018, is state aid to modest households to help them pay their energy bills, regardless of the heating mode (electricity, gas, wood, fuel oil, LPG, etc.) or energy renovation works. State aid allocated to households' energy expenditure is the tool to mitigate 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 according to 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.

The arrangements for the development of the energy voucher following the abolition of the housing tax are currently being studied. Improvements to the scheme may also be explored as part of this

²⁸Article 35 of Law No 2022-1158 of 16 August 2022 laying down emergency measures to protect purchasing power and Decree No 2023-133 of 24 February 2023 on the minimum electricity supply period and amending Decree No 2008-780 of 13 August 2008 on the procedure applicable in the event of unpaid electricity, gas, heat and water bills

reform. The next partnership between the Ministry of Energy Transition and the France Services Houses will strengthen information and support to beneficiary households to facilitate the use of the energy voucher and associated rights.

The rate of use of the energy voucher is improving every year. The rate of use of the 2022 energy voucher was 82.6 % in mid-September 2023 (compared with a use rate of 81.6 % for cheque 2021, 80.6 % for cheque 2020, 80.4 % for cheque 2019 and 78.4 % in 2018).

An exceptional energy voucher of EUR 100 to EUR 200 was distributed between the end of 2022 and the beginning of 2023 to the lowest 40 % of households.

The energy voucher decreases the indicator of energy poverty corrected for weather from 11.7 % to 10.2 % (the gross indicator rises from 11.9 % to 10.4 %). Taking into account the exceptional voucher, the energy poverty indicator corrected for weather is reduced to a total of 11.7 % to 9.2 % (the gross indicator rises from 11.9 % to 9.4 %). The energy voucher therefore decreases the energy poverty indicator by 1,5 points and the exceptional energy voucher by an additional 1 point, with a total reduction of 2,5 points.

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 in order to prepare France for the future, preserve the social model, improve our industrial sovereignty and achieve full employment. On the other hand, reindustrialisation has benefits for the climate, as it can lead to very substantial gains on the French carbon footprint, taking advantage of the French electricity mix that is largely decarbonised. The Government thus intends to support the reindustrialisation of France, in line with the objectives of the green transition. This should make it possible to improve France's footprint, develop its resilience and create added value and new jobs.

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

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

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 in the multiannual energy planning the trajectories of the decarbonised energy production stock.

In addition, reinvigorating a French industrial sector for the production of renewable energy, covering its entire value chain, from production to recycling and extraction and securing the 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 this field, but faces difficulties in finding competitive industrial sectors. The reindustrialisation of France in the field of renewable energy must involve the development of gigafactories in order to enable French and European champions to emerge which are competitive on the international stage.

The value chain as a whole must be valued on French territory. It is therefore necessary to set up a chain for the recovery of energy waste and the reprocessing of composite materials.

This reindustrialisation cannot be achieved without public support to ensure sustainable settlement and growth. It must also involve Community work to capitalise on local know-how through a set of criteria and incentives needed to maintain 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 a change in the criteria for invitations to tender for sectoral support, 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, notably in the context of the Green Industry Act recently adopted by Parliament. Supported by sectoral contributions, this law will fully contribute to this objective of acceleration through each of its 4 axes:

- Finance the green industry by mobilising 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 lead times for industrial sites in France, in particular by dividing industrial installation times by two;
- Encourage virtuous companies in all State interventions, using the significant leverage of public procurement;
- Training in jobs in the green industry by putting industry at the centre of training in order to make it more attractive and meet the growing demand for work for the green transition.

A working group involving all renewable sectors is also responsible for formulating proposals for the reindustrialisation of renewable production. Sector compacts, such as the offshore wind pact, must be implemented soon, in particular on photovoltaic, terrestrial wind, and network industries.

Finally, with the aim of providing clear signals to industry and promoting the development of the sectors needed for the transition, **the EPP will define industrial targets that will constitute deployment objectives on the national territory.**

2.5.2. French investment strategies in low-carbon technologies

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

As early as 2010, France had a programme of investments for the future (PIA) designed to provide the French R & D ecosystem with the necessary means to align itself with the country's long-term objectives, particularly from the climate point of view. In 2021, the France 2030 investment plan was launched to take over from the fourth phase of future investment (AIP 4), announced in 2020. In total, France 2030 is releasing 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 to spend both 50 % of its spending on decarbonising the economy and 50 % on emerging innovation-enhancing actors without environmentally harmful expenditure (*Do No Significant Harm* principle). France 2030 extends the

objectives of the Investissements d'Avenir mission by integrating support for industrial scale deployment (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 envisages strengthening the funding of the higher education, research and valorisation ecosystem as a whole, in order to create the ground for unexpectedly disruptive innovations. The second is ‘led’ innovation, which responds to the need to define investment priorities to meet the transition challenges of the French economy. This strand therefore targets certain key sectors, markets or technologies on which public support should be concentrated. It is broken down into ten major industrial and technological objectives, underpinned by five “prerequisites for success” of the plan.

For example, five of France 2030’s ten “strategic priorities” 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 disruptive innovation on advanced nuclear reactors (SMR, new uses) and by being at the forefront of research on safety and waste management.
- **Become 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 in the production of hydrogen by electrolysis and the entire value chain (membranes, fuel cells, tanks, etc.). France therefore aims to be able to rely on its soil at least two giga-factories of electrolyzers 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 triptyque of nuclear, hydrogen and renewable energy must enable France in the future to produce decarbonised, stable and competitive energy.
- **Decarbonise our industry to meet our commitment to reduce greenhouse gas emissions in this sector by 35 % between 2015 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 chemistry, cement plants, aluminium) and the deployment of mature solutions (renewable heat, energy efficiency, electrification).
- **To produce 2 million zero-emission vehicles in France by 2030 and develop low, sovereign and resilient mobility.** The automotive industry’s transition efforts must be supported by public support for the industrialisation of new mobility solutions (electric vehicles powered by batteries, hydrogen, collective transport, light mobility, etc.). The entire industrial ecosystem must be mobilised to anticipate and drive technological developments, against the background of the planned end of thermal vehicles in 2035.
- **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 in the aviation sector. It mobilises large groups, but also innovative SMEs and start-ups in the sector.

In addition to these five objectives, one of the five “prerequisites 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 increase its dependence on the supply of critical materials in the coming decades, particularly with the high penetration of renewable energy (very concentrated in materials per kWh produced, and with a limited lifespan). France 2030 must 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 petroleum polymers. In addition, securing the supply chain, refining and recycling of critical metals will anticipate the risk of bottlenecks upstream of the low-carbon technology 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 working groups “Zero-emission vessels” and “Green Hydrogen”. The French R & I targets for the energy transition are also part of a European framework, with a dynamic commitment to the various partnerships that make up the SET-Plan.

3. POLICIES AND MEASURES

Just Transition Funding

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

- Generalised in 2018 to replace social energy tariffs, the French Government introduced an ‘energy voucher’, which is aid paid, subject to means-tested conditions, for the payment of energy bills (electricity, gas), the purchase of fuel (wood, fuel oil), and certain energy works;
- The Energy Saving Certificates scheme requires energy suppliers to finance a certain amount of energy renovation works in French households, some of which are energy poor households;
- MaPrimeRénov’ is a subsidy scheme for private individuals to finance energy renovation works: insulation, change of heating system, installation of ventilation, performance of an energy audit, or even global renovation. In 2022, 67 % of projects concern small and very small households, for which the grant ceiling is increased;
- In order to better finance the rest and make it easier for households to access bank loans, in addition to existing tools such as the zero-interest eco-loan (ecoPTZ), the Ready for Renovation or Change is a tool created in March 2022, which makes it possible to repay the remainder at a later stage, for example on the sale of the dwelling or as part of a succession, with a public guarantee of 75 % of any loss incurred;
- The French authorities have put in place two main aids 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 motor quadricycle; and the conversion premium, which can be combined with the bonus, which supports the purchase of a low-polluting vehicle of the same categories, provided that an old polluting car or van is discarded. Since 1 January²⁰²³, only 100 % electric motor vehicles have been eligible for the green bonus and its amount is now increased for households on the first 5 income deciles, and the amounts of the conversion premium are increased for households on the first 2 income deciles and households in the first five income deciles with a ‘large router’ profile.

- In addition to the ecological bonus and the conversion premium, referred to above, the French authorities have set up 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-interest loan experiment, in low-emission mobility zones where air quality standards are regularly exceeded, for the acquisition by a micro enterprise or a household of the first five deciles of income of a light vehicle emitting less than 50 gCO₂/km. The maximum amount of the loan is EUR 30 000.
- Finally, the French authorities are planning to set up a leasing scheme, which will allow small households to have access to a long-term rental offer of environmentally efficient electric cars, amounting to EUR 100 per month, starting on 1 January 2024, with a possibility of pre-registration already this autumn.

Adaptation and development of skills

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

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

France will present its strategy for the development of jobs and skills in the final update of the CNECP, which will be transmitted in 2024.

Supporting labour market developments

See parts 2.5.1 and 3.5.1.

Approach for regions affected by the transition

The budget programme of the Ministry of Energy Transition finances appropriations for the implementation of 4 Pacts of Territory “Charbon” and the seed fund “Fessenheim”. 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 the preliminary studies of projects, contribute to the financing of the infrastructure needed to carry out these projects or, more broadly, to revitalise the regions, or even aid to companies for their installation if 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 Energy and Climate Law of 8 November 2019, which limits CO₂ emissions from 1^{January} 2022 for installations for the production of 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, owned by EDF and Gardanne, and eventually Saint-Avoid belonging to Gazel Energie.

In the case of plant employees, job losses should be limited. The measures are taken by the State in addition to the financing by the company of an employment protection plan and redeployment leave plan. Their purpose is to enable them to return to work as quickly 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 consumers' behaviour and, beyond, their imaginary and lifestyle desires. Through advertising, companies can help promote products or consumption patterns that have a lower impact in terms of greenhouse gas emissions, air pollution, water, soil, waste generation and the use of raw materials. Several recent regulations provide **a framework for marketing communications in the context of the green transition**: since 1^{January} 2023, claims of carbon neutrality of products and services have been strongly framed by Article 12 of the Climate and Resilience Law. In this sense, these claims, in order to be used, must comply with a strict regulatory framework in order to combat greenwashing. Another example: vehicle advertisements are required to communicate the importance of soft and active modes of travel, and to make the greenhouse gas emissions of vehicles **visible**. Finally, climate contracts have engaged several companies in responsible communication processes.

Energy saving

As regards energy saving, France has put in place mechanisms to focus its action on helping households in poverty.

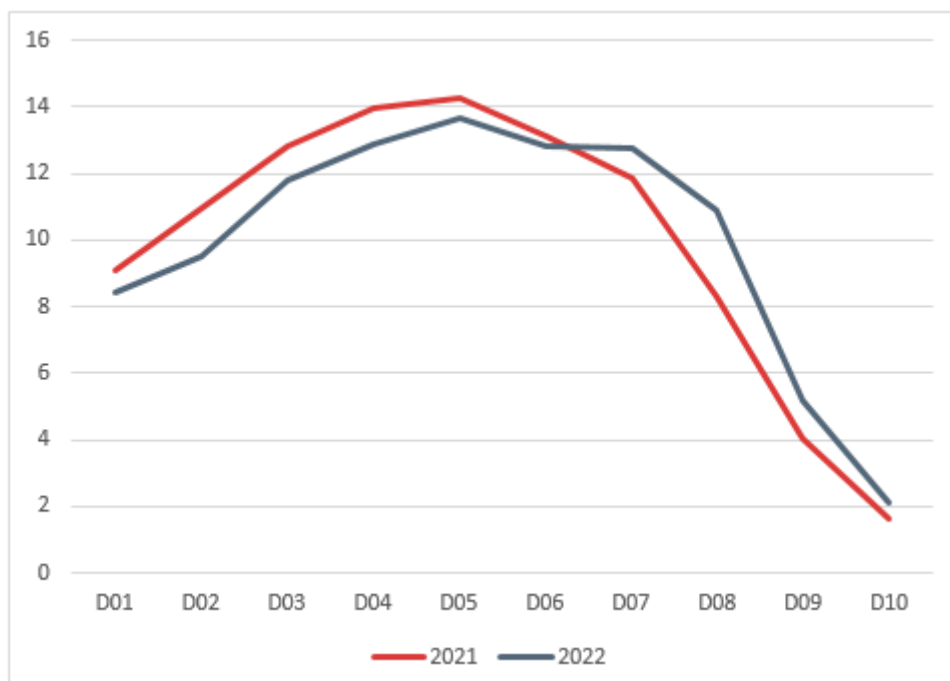
For example, the energy saving certificates scheme has imposed energy savings obligations for households in poverty since 2016, under the Law on energy transition and green growth. These 'poverty' obligations are on the rise, in parallel with the general increase in the energy efficiency target:

- 3th^{EEC} period (P3): 150 TWhc over the period 2015-2017
- 4th^{EEC} period (P4): 533 TWhc over the period 2018-2021
- 5th^{EEC} period (P5): 1 130 TWhc over the period 2022-2025

Due to the recent publication of the revised Energy Efficiency Directive (2023/1791/EU), work is underway to identify the amount of the 6th^{EWC} period (P6), which corresponds to the years 2026-2030, as well as actions to further develop and improve the system of energy saving certificates.

In addition, the amount of support for households associated with the Energy Renovation Facility ('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:



* 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

Figure 29: Energy savings associated with work supported by MaPrimeRénov', by decision on living standards for occupying households (%)

It is notable that the MPR scheme was reinforced in favour of the smallest households in 2023²⁹ and will continue to evolve as part of the restructuring of ANAH support in 2024.

Finally, the public service for the renovation of housing, France Rénov', is the one-stop shop that allows individuals, particularly the smallest ones, to obtain advice and information on how to renovate their homes, independently. The French Rénov' mentors therefore accompany individuals and help them obtain the financial aid they are eligible for.

Renewable energy communities

France supports renewable energy communities and many legislative and regulatory measures have been put in place to speed up the development of self-consumption (individual and collective): clarification of the public procurement code for local authorities, exemption from the obligation to create an additional budget for local authorities which use own consumption below a certain budget,

²⁹ Since 1^{October} 2023, low-income and very low income households carrying out a comprehensive renovation can benefit from increased support:

- for very low income households: the financing rate is increased to 65 % of the value of the works (previously 50 %);
- for low-income households: the financing rate is increased to 50 % of the value of the works (previously 35 %).

extension of the scope of collective self-consumption to take account of the specific features of peri-urban areas, etc.

3.1. D“ decarbonation”

3.1.1. Greenhouse gas emissions and removals

3.1.1.1. 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

Planned policies and measures to achieve France’s ESR 2030 target

The following section describes the planned policies and measures for each issuing sector, i.e. options that are under consideration and have a real chance of being adopted and implemented after the date of submission of the integrated national energy and climate plan, as defined in the Regulation on the Governance of the Energy Union.

This section also describes the first sectoral and cross-cutting guidelines set out in the draft SNBC 3. The first assumptions and orientations described below stem from the extensive work of consultation and dialogue with stakeholders, the general public and economic actors undertaken in October 2021. They have been drawn up to enable the achievement of the French targets for reducing greenhouse gas emissions (see Section 2.1.1), in addition to the measures currently in place. They are not definitive and are likely to evolve in line with the feedback of stakeholders in the forthcoming stages for the finalisation of the SNBC (public consultation, programming law, consultation of the referencing committees).

Once the strategy is adopted, these guidelines will be legally enforceable for the public sector and should guide the development of future public policies.

Transport

The planned policies and measures and orientations of the draft SNBC 3 in the transport sector are described in Part 3.1.3 (iii) Low carbon mobility policies and measures.

Residential/tertiary

- **Planned policies and measures**

Many planned policies and measures to reduce GHG emissions from the residential/tertiary sector are measures to improve the energy efficiency of buildings, reported in section 3.2. Energy efficiency and development dimension of renewable energy, as reported in Part 3.1.2 Renewable energy.

For new buildings, environmental regulations RE2020 impose ambitious and demanding standards. Its aim is to continue improving the energy performance and comfort of buildings, while reducing their carbon impact. Energy consumption thresholds are lowered, with high insulation quality requirements. The carbon impact is minimised and comprehensively taken into account, through life-

cycle analysis, from the manufacturing of materials to dismantling. Finally, buildings must be more resilient to the conditions of the future climate, in particular by being more resistant to heatwaves.

Budgetary, fiscal, regulatory and accompanying measures are needed to improve the energy performance of existing buildings: financing of energy renovations (progressive 'MaPrimeRénov' aid based on income, energy saving certificates, zero-rate eco-loans, reduced VAT, etc.), labelling of recognised environmental operators, training of professionals, awareness-raising among households in order to initiate renovation decisions or encourage virtuous use (public service of one-stop shops for information, advice and support to households, obligations relating to the individualisation of heating costs in collective dwellings), obligation to implement thermal insulation when carrying out major building renovation works (facade reclamation, roof refurbishment, refurbishment of rooms).

Recently, the Climate Development Resilience Act, promulgated in July 2021, strengthens all these measures, including: including a carbon component in the Energy Performance Diagnostic (EPD) of buildings, which is mandatory for renting and selling; banning the rental of the most energy-consuming and greenhouse gas emitting dwellings (already in 2023 for the most energy-intensive dwellings and then class G in DPE in 2025, F in 2028, E in 2034). The recovery plan following the COVID-19 epidemic increased the amounts of aid from MaPrimeRénov'. These amounts will be increased again for the 2024 budget, with more incentives for major renovations.

Finally, the service sector is now under an obligation to reduce its energy consumption through the tertiary eco-energy scheme, which applies to buildings of more than 1 000 m², with ambitious targets: —40 % in 2030, -50 % in 2040, -60 % in 2050.

The draft SNBC 3 sets out the following strategic orientations for the residential/tertiary sector:

- ✓ Increasing and reshaping aid for energy renovation
- ✓ Structuring a heat pump sector in France
- ✓ Massive development of heating networks
- ✓ Strengthening support for renovation
- ✓ Renovation of the social park
- ✓ Development of the renovation sector
- ✓ Planning the transition to low carbon heating
- ✓ Development of the heat pump sector and district heating networks
- ✓ Trajectory for reducing energy consumption of the tertiary eco-energy scheme
- ✓ Trajectories of the Energy Efficiency Directives and the Energy Performance of Buildings
- ✓ Support for the financing of renovation works, as part of the renovation of the tertiary sector
- ✓ Sobriety plan
- ✓ Compliance with the BACS Decree (*Building automation and control system*)
- ✓ Sobriety on power consumption

Industry (excluding ETS)

- **Planned 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 dimension and development 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 means are deployed for the decarbonisation of industry. For example, **the industrial decarbonisation fund** implemented under the Recovery Plan for the period 2020-2022 was allocated EUR 1,2 billion. This fund has supported 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 have been supported leading to an estimated emission reduction of 4,5 MtCO_{2e}/year.

For the period 2022-2026, the **'France 2030' investment plan** devotes EUR 5,6 billion to decarbonise industry along two main lines:

- EUR 5 billion is dedicated to the deployment of industrial site decarbonisation solutions through 2 components to be implemented by the end of 2022:
 - EUR 4 billion to support the deep decarbonisation of highly emitting industrial sites (e.g. steel, heavy chemistry, cement, aluminium);
 - EUR 1 billion for the deployment of more mature solutions in the French industrial fabric, including low-carbon heat and energy efficiency.
- EUR 610 million is dedicated to the emergence and industrialisation of industrial decarbonisation solutions (support for innovation).

In addition to public support, a major effort to draw up **roadmaps for the decarbonisation of industrial sectors** has also been launched by the Government with industrial stakeholders since 2019 to engage industry in the transition. Some sectors have thus published roadmaps (Chemistry, Mines Metallurgy, Papier Carton, Cement), which constitute cross-state/sectoral commitments by 2030.

On the perimeter of industrial sites, at the end of 2022, the President of the Republic asked the 50 most emitting industrial sites in France, in consultation with the ministries concerned, to draw up roadmaps identifying decarbonisation pathways to reduce their greenhouse gas emissions in accordance with the French objectives for the industry sector. For example, the 23 industrialists involved worked on roadmaps with milestones to 2030 and 2050. The elements from the roadmaps are intended to remain confidential, but give ministries the key to assisting 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 transport, H₂), as well as any necessary regulatory developments.

Furthermore, since 2020 ADEME has been building sectoral transition plans with the 9 most energy-intensive industrial sectors (steel, aluminium, glass, cement, ethylene, chlorine, ammonia, paper/board, sugar), a methodological initiative proposing to model different decarbonisation pathway scenarios by 2050, quantify the impact on production costs, assess climate investment needs and analyse changes in jobs. These plans are being developed as part of the European LIFE Finance Climat project and will be finalised by 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 'Reduction of energy consumption in all sectors'): **energy savings certificates** scheme, **Ademe Heat Fund** and **obligation to carry out energy audits** for large companies.

Some specific additional schemes for 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 purchase or installation works carried out by VSEs and small SMEs investing in equipment generating energy savings certificates;
- Ademe's **decision-making aid** scheme 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 **PROREFEI training programme**, launched in 2018 and financed by the Energy Saving Certificates scheme, aims to train those in charge of energy management in companies to become real energy comparators who will be able to design, implement and coordinate actions to improve the energy performance of their sites. It also aims to create a network of energy focal points who will have access, in particular, to feedback from the community as a whole and to technical and regulatory monitoring;
- The **INVEEST programme**, also funded by the Energy Saving Certificates scheme, is aimed at financial actors (bankers, auditors, accountants, etc.). Through a training and coaching programme combining energy, financial and industrial expertise, this programme aims to accelerate the financing of energy efficiency projects in industry;
- 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 makes it possible for an industrial operator to assess the profitability of waste heat recovery through connection to a district heating or cooling network and is accompanied by the implementation of the solutions deemed to be cost-effective. The main industrial sectors affected by the measure are chemical, glass, cement, lime, plaster, paperboard, metal processing and agri-food;
- Since 2016, electricity-intensive businesses 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 within 5 years a performance target monitored by means of indicators subject to certification 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 scheme**.

Regulation No 517/2014 ('F-Gas II') introduces a number of provisions aimed at reducing emissions of fluorinated gases from air-conditioning and cooling equipment, including industrial cooling (see detailed description of the regulation in section B.8). The revision of this F-Gas Regulation is being launched in order to further reduce the production and placing on the market of fluorinated greenhouse gases in the EU. The proposal currently under discussion between the Member States provides for a 95 % reduction in the placing on the market of hydrofluorocarbons (e-HFCs or F-gases) by 2030 compared to 2015 (compared to 80 % under the F-Gas Regulation currently in force).

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 change 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 of reducing the use of HFCs which had been set for refrigeration and refrigeration professionals in 2019.

The 2019 Finance Law also created an overdepreciation scheme to accompany, until the end of 2022, companies' investment efforts in cold production equipment using low-warming refrigerants. Undertakings subject to corporation tax or to income tax under a real tax system may thus, under that scheme, deduct from their taxable profit or loss an amount equal to 40 % of the original value of the equipment for refrigeration and air treatment without HFCs acquired in new condition between 1^{January} 2019 and 31 December 2022.

Measures to reduce N₂O_{emissions} from industry:

Since 2013, N₂O emissions_{from} the chemical sector have been subject to the European emissions trading scheme.

- **SNBC Guidance**

The draft SNBC 3 sets out the following strategic orientations for the industry sector:

- ✓ Financial support for investments to decarbonise industry
- ✓ Increased incentives to implement energy efficiency improvements
- ✓ Strengthening the electricity grid and low-carbon generation
- ✓ Ensuring a competitive decarbonised electricity price compared to fossil solutions
- ✓ Development of geological storage solutions for CO₂
- ✓ Support for industrial transformation, particularly in terms of jobs
- ✓ Mobilising the circular economy as a lever for decarbonisation

Waste treatment

- **Planned policies and measures**

The reduction of emissions in the sector is based on waste prevention (ban on single-use plastic bags, combating food waste, penalising planned obsolescence), developing extended producer responsibility systems, 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 by 2024, extension of sorting instructions, etc.), an improvement in the rate of methane capture in waste storage facilities, and tax measures to limit the disposal of waste in landfill or incinerator (waste component of the general tax on polluting activities). Waste prevention and management policy is supported financially by the waste fund (funded by the revenue from the waste component), the circular economy fund run by ADEME and the calls for projects entitled 'Zero Waste, Zero Waste Territories', which accompanies local authorities.

- **SNBC Guidance**

The draft SNBC 3 sets out the following strategic guidelines for the waste treatment sector:

- ✓ Avoidance of waste

- ✓ Compliance with the obligation to sort bio-waste at source
- ✓ Massive development of sorting, in particular via EPR channels
- ✓ Improvement of Non-Hazardous Waste Storage Facilities (NHazardous Waste Storage) Coverage Technologies to improve methane capture rate
- ✓ Development of waste stabilisation before storage

Agriculture

- **Planned policies and measures**

Agriculture accounted for 18 % of France's emissions in 2021. It is the second most emitting sector after transport.

In the context of the COVID-19 pandemic, the 'Agricultural, food and forestry transition' component of the 'France Relance' plan sets out 3 objectives: **strengthening food sovereignty; accelerating the agro-ecological transition to give all French people access to healthy, sustainable and local food; and adapting agriculture and forestry to climate change**. EUR 1,4 billion is specifically earmarked for the agricultural and agri-food sectors, together with the cross-cutting measures of the France Relance plan, which will benefit farmers and the agri-food industries. In particular, the measures of the **National Plan for Plant Protein, "Plantons des hedges" and "Good Diagnostic Carbon"** contribute to addressing the climate change mitigation (and adaptation) challenges of the agricultural sector³⁰.

As part of the Grand Investment Plan (GPI) presented by the Prime Minister at the end of 2017, the GPI's agricultural component is worth EUR 5 billion over 5 years (2018-2022). It aims to speed up the adaptation of tools and change in agricultural practices, fisheries, agri-food and the forest-wood sector³¹. It is structured around 9 actions grouped into 3 structural axes³². Axis 1 "Transformation of upstream agricultural and forestry" brings together four actions: support for investments in agricultural holdings, support for change in practices, support for agricultural methanisation and support for investments in forests. Axis 2 "Improving the competitiveness of agricultural and forestry downstream" brings together two actions: support for the upscaling up of agricultural downstream and support for the modernisation of forestry downstream. Axis 3 "Innovation and structuring of sectors" comprises three actions: innovation competition, support for collaborative and territorial innovation projects and support for structural investments in the sectors.

The National Strategic Plan (NSP) for the period 2023-2027 was drawn up following an electronic public debate and public consultation. The NSP will be able to contribute to the dynamics of declining agricultural emissions and to increasing the carbon storage potential for agriculture and forestry, in particular through the new ecoregime, enhanced conditionality and Pillar² measures. Article 274 of the Climate and Resilience Law stipulates 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 permanent grassland and limiting its tillage, encouraging the planting and sustainable maintenance of hedgerows, the objective of**

³⁰<https://agriculture.gouv.fr/telecharger/118602>

³¹<https://www.gouvernement.fr/action/le-grand-plan-d-investissement-2018-2022>

³²https://draaf.grand-est.agriculture.gouv.fr/IMG/pdf/20180920-GPI-Presentation_Grand_Est_cle068139.pdf

doubling agricultural areas with leguminous crops and organic farming, and incentives to maintain and develop more autonomous livestock farming systems that can contribute to the achievement of climate change objectives.

Furthermore, the **Varenne agricole de l'eau et de l'adaptation to climate change** aims at strengthening the resilience of agriculture in a holistic approach, including soil, varieties, cultivation practices, agro-ecological infrastructure and irrigation water efficiency. The work of the Varenne agricole de l'eau has been available since December 2021³³, and the France Relance and France 2030 plans will allow implementation from 2022 onwards through support for equipment in the 3th agricultural revolution and support for the sectors, part of which will be devoted in particular to support water innovation.

Finally, the **climate action plan of the Ministry of Agriculture**, 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 share of greenhouse gas emissions in agriculture (45 %): improving manure management, optimising herd management and adjusting animal feed meets this challenge.

Agricultural methanisation reduces methane emissions through manure treatment. **The biogas production chain by methanisation** is booming. At the end of September 2021, 1086 methanisers produce biogas and value it by injection into natural gas networks (308) or electricity production (778), i.e. 225 new methanisers put into operation in one year.

- The multiannual energy programming (2019-2028)³⁴ 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, giving natural gas suppliers an obligation to support biogas production.
- 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; an additional remuneration scheme for electricity produced by biogas from methanisation is intended for installations far from the 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 facilities to the natural gas networks and the injection of the volumes of renewable gas produced in this way. It was revised in November 2020, reserved for projects with a production capacity of less than 25 GWh/year, to take account of the level of maturity achieved by the sector and the decrease in production costs. The mandatory purchase obligation scheme for biomethane injected into a natural gas network following a call for tenders is intended to support projects with a production capacity exceeding 25 GWh/year;

³³<https://agriculture.gouv.fr/tous-les-travaux-autour-des-3-thematiques-du-varenne-agricole-de-leau-et-de-ladaptation-au>

³⁴<https://www.ecologie.gouv.fr/programmations-pluriannuelles-lenergie-ppe>

- The energy methanisation nitrogen autonomy plan (EMAA), which entered into force in 2013, provides for simplification of administrative procedures for the development of methanisation projects, better support for project promoters and efforts to structure the sector;
- Since 2015, the plan for the competitiveness and adaptation of agricultural holdings (FECF) has offered financial support for investments made by farms, such as the modernisation of livestock buildings, improved manure management (covering pits), improving the food autonomy of livestock, and improving the energy performance of farms, in particular by developing methanisation. It makes it possible to modernise the production system, innovate, combine economic, environmental, health and social performance, and encourage the setting up of new farmers. It is broken down in each of the regional rural development programmes, the regions of which are managing authorities. Since 2018, it has been integrated into the tools of the agricultural strand of the Grand Investment Plan designed to meet the challenges of modernising agricultural holdings. It also supports the implementation of the measure “Biosafety and animal welfare in livestock farming” of the Recovery Plan, with EUR 90 million (including EUR 86,5 million for investment support). Between 2015 and 2019, the overall annual GAEC envelope almost doubled from EUR 313 million in 2015 to EUR 621 million in 2019³⁵;
- In 2019, a guarantee fund was set up by the Ministry responsible for agriculture with a total of EUR 25 million in order to enable BPI 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 financial 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 conditionality, eco-regime, agri-environment-climate measures (AECM), investments, increased coupled support for legumes, or the ceilings of the ICHN and coupled bovine aid, which take account of the forage area, which is largely composed of grasslands in our country. These measures encourage the extensification of livestock farms, with greater use of grazing and the protein autonomy of farms through increased leguminous production. The NSP promotes the closing of crop and livestock cycles at farm and territorial level, and improved manure management.
- **The National Agricultural and Rural Development Programme (PNDAR)** integrates 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 approaches 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 on grazing and their ability to exploit a diversity of forage resources (particularly herbaceous and ligneous).
- Consumption of legumes (plant proteins) is on the rise in households in France. It increased by 9 % between 2015 and 2017. Enabling French people to **diversify their protein intake by eating dried vegetables produced locally 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 to meet this growing demand. Legumes have an undeniable nutritional interest in food but also in reducing associated GHG emissions (leguminous crops contribute to the development of practices requiring less fertilisation on

³⁵<https://agriculture.gouv.fr/plan-de-competitivite-et-dadaptation-des-exploitations-agricoles>

rotation, provide feed materials as an alternative to imported soya and can come from deforested areas, and produce dried pulses for human consumption). **The National Food and Nutrition Programme³⁶ (2019-2023) provides for this rebalancing of plant and animal proteins in diets.** In this context, the EGALIM Law³⁷ introduces the proposal for a weekly vegetarian menu for mass catering services in an experimental setting. This proposal became mandatory with the Climate and Resilience Act (Article 252), which also provides for a daily proposal for a vegetarian menu, on an experimental basis, for mass catering managed by voluntary local and regional authorities. In the interests of example, the State will offer a vegetarian menu on a daily basis in the event of multiple choices offered to guests in its canteens and those of its national public establishments and public undertakings. This provision will also concern 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), including 90 % of nitrous oxide (N₂O) emissions. **Nitrous oxide emissions are the 2th share of GHG emissions from agriculture (42 %).** A share (84 %) of these emissions is direct, mainly related to the use of mineral nitrogen fertilisers (29 %), pasture drops (23 %), but also agricultural residues (12 %), the management of animal manure in building and storage (7 %) and the application of organic fertilisers and soil improvers (9 %); the remaining emissions are indirect (16 %) and related to nitrogen losses through volatilisation and leaching. Optimising the nitrogen cycle and improving plant protein autonomy responds to this challenge. **The policies accompanying the decline in the use of mineral nitrogen fertilisers are based on the Nitrates Directive with the 6th Nitrates Action Programme, the Climate and Resilience Law and the National Strategy on Plant Protein³⁸.**

The **Climate and Resilience Act** (published in August 2021 – Article 268) provides for a 15 % reduction in nitrous oxide emissions in 2030 compared to 2015, in line with the existing carbon budgets of the national low-carbon strategy. The implementing decree defining the trajectory for the agricultural sector was published on 26 December 2022³⁹. The Climate and Resilience Law also provides for a national action plan to reduce nitrous oxide emissions from mineral nitrogen fertiliser uses (National eco-nitrogen action plan) to support stakeholders in this direction; it shall also consider the possibility of a charge if the N₂O emission reduction trajectory is not met for two consecutive years. This is consistent with NH₃ emissions for air quality.

The national strategy on plant proteins aims in particular to develop legumes through the plant protein plan worth over EUR 150 million thanks to the France Relance Plan, supplemented by the 4th Investment Plan for the Future (PIA4). It supports research and innovation, support for material investments, support for the structuring of plant protein sectors and downstream investments, and aid for the promotion of legumes. The strategy must make it possible by 2030 **to double the areas devoted to these products to 2 million hectares** (8 % of utilised agricultural area). By increasing legume areas, it will contribute to reducing the use of synthetic nitrogen fertilisers, which are a major contributor to N₂O emissions, and to strengthen our independence from imports of protein-rich materials, including soya imported from third countries.

³⁶<https://agriculture.gouv.fr/programme-national-pour-l'alimentation-2019-2023-territoires-en-action>

³⁷<https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000037547946/>

³⁸<https://agriculture.gouv.fr/lancement-de-la-strategie-nationale-en-faveur-du-developpement-des-proteines-vegetales>

³⁹ <https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000046806990>

In addition, the **National Strategic Plan (NSP) 2023-2027** provides for almost double coupled aid to support 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. The NSP aid also aims at doubling the area under organic farming by 2027 (18 % of the total UAA), thus increasing crop diversification with the introduction of 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 utilised agricultural area cultivated with 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 the fight against nitrogen surpluses, a priority issue for the agricultural sector. Steadily increasing since the 1970s, the quantities of mineral nitrogen sold (kg) relative 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 marketing years known (2018 to 2021), with values of 75, 77 and 69 kg respectively.

Nitrate action programmes, which are mandatory in vulnerable zones, require the balance of nitrogen fertilisation and the proper 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 leakage to the environment. Soil cover is mandatory for all parcels in vulnerable areas with long intercultivation duration⁴⁰, which may help to temporarily immobilise nitrogen so that it becomes available when the main crop needs it.

The **energy methanisation nitrogen autonomy plan** is part of an agronomic approach based on respect for the balance of fertilisation and the overall reduction in the use of inputs. The plan contains a set of tools for better nitrogen management, including calls for projects, knowledge valorisation and dissemination, and simplification of administrative rules.

The **“Ambition bio 2022”** programme was presented in June 2018. It aims to cover 15 % of the utilised agricultural area under organic farming by 2022. It has a budget of EUR 1,1 billion⁴¹ and is structured around seven main axes: to develop production, the structuring of sectors, the development of organic consumption, the strengthening of research, the training of stakeholders, the adaptation of regulations and the development of organic production in overseas territories. The NSP aid also aims at doubling the area under organic farming by 2027 (18 % of the total UAA), thus increasing crop diversification with the introduction of legumes in rotations, reducing the uses and risks associated with plant protection products and making better use of organic fertilisers.

Ecophyto II + is the French national action plan, provided for in Directive (EU) No 2009/128 on the reduction of the use and risks of using plant protection products. It is currently being revised and the new Strategy, Ecophyto 2030, is expected to be published in early 2024. The ambition of Ecophyto II + and Ecophyto 2030 is to reduce dependency on plant protection products and their impacts on health and the environment by promoting a re-design of agricultural systems based on agro-ecology and in particular integrated crop protection.

⁴⁰ Order of 19 December 2011 on the national action programme to be implemented in vulnerable zones in order to reduce water pollution by nitrates of agricultural origin

⁴¹<https://agriculture.gouv.fr/ambition-bio-2022-plan-dactions-des-acteurs-de-lagriculture-et-de-lalimentation>

The **Sustainable Seed and Agriculture Plan**, launched in 2016, supporting the selection of nitrogen-efficient plants and improving legume seed resources, contributes to limiting N₂O emissions. On the occasion of the International Conference on the Green Development of the Seminary Sector organised by the FAO on 4 and 5 November 2021, a new seed and seedlings plan for agro-ecology, adaptation to climate change and food sovereignty was launched. It provides for actions organised around four strands of work: diversity of varieties and species, environmentally sound food quality, participatory approaches and the use of new techniques, scientific expertise for the benefit of public authorities and society⁴².

The **plan for the competitiveness and adaptation of agricultural holdings** proposes investment aid to promote, inter alia, the rational use of mineral fertilisation and the development of legume cultivation. Reducing CO₂ emissions by controlling energy consumption and developing renewable energies in agriculture

Agricultural methanisation, mentioned above, allows the production of biogas. This biogas can be used as renewable energy in various forms:

- Simple heat production that will be consumed close to the production site;
- By the combined production of electricity and heat (CHP) by combustion in an engine;
- By injection into the natural gas networks after a cleaning stage (biogas becomes biomethane);
- By converting into fuel in the form of natural gas vehicle (GNV).

The plan for the competitiveness and adaptation of agricultural holdings, referred to above, also makes it possible to subsidise additional measures to reduce energy consumption and develop renewable energies.

Measures addressing the various levers to reduce emissions from agriculture

Agri-environment-climate measures (AECM) make it possible to provide financial support to farms which undertake to develop practices combining economic and environmental performance or to maintain such practices when they are at risk of disappearance. For the period 2014-2022, the following agri-environment-climate measures are preferred:

- AECMs based on a system logic, consisting of proposing a global commitment of a holding, rather than committing only plots of land on which there is a particular environmental challenge;
- Maintaining practices for extensive grassland systems/limiting intensification and return of organic matter to soil;
- Maintenance and change of practice for polyculture-livestock systems/limitation of inputs; — change of practice for arable crops/limitation of inputs;
- Introduction of legumes in irrigated systems (in particular in maize monoculture systems);

⁴²<https://agriculture.gouv.fr/lancement-du-nouveau-plan-semences-et-plants-pour-une-agriculture-durable>

- Maintenance of topographical elements such as hedges, jars, tree alignments, etc.

For the period 2023-2027, the AECMs, which are particularly relevant for climate mitigation, include the ‘transition of practices’, ‘soil quality and preservation’, ‘climate – animal welfare – fodder and food autonomy for livestock farming’.

The agro-ecological project encourages innovation and the transition to new, efficient production systems in all their dimensions (economic, environmental, and social) by promoting research, training and communication on agroecology.

The “Teaching for Another Production” plan was launched to generalise agroecology in agricultural education. Today, the new plan “Teaching to produce differently, for transitions and agroecology” aims to amplify the dynamics around 4 axes: encourage learners’ voice and initiative on transitions and agroecology issues; mobilise the education community to teach agroecology and continue transitions; scaling up the mobilisation of farms and technology workshops as a means of learning, demonstration and experimentation; develop local animation and spin-offs of innovative practices.

The 2030 National Biodiversity Strategy published in spring 2022⁴³ foresees the preservation of sensitive ecosystems, including carbon-rich ecosystems such as grasslands, inter alia through the 4th Wetlands Action^{Plan} 2022-2026.

The agricultural part of the Circular Economy Roadmap (FREC), published in 2019, aims to mobilise fertilisers from recycling to partly substitute mineral fertilisers from non-renewable resources and contribute to the input of organic matter, and thus carbon, into soils.

Led by the Ministry responsible for energy transition, the low-carbon label⁴⁴, **launched in 2019**, aims to reward virtuous behaviour to reduce greenhouse gas emissions and carbon sequestration in all sectors (forest, agriculture, transport, buildings, waste, etc.), which go beyond usual practices, and to value them economically through voluntary financing by private or public actors, in order to trigger local and additional action. The Low Carbon Label enables voluntary or private financing to be triggered or corresponding to the fulfilment of clearing obligations (cf. Article 147 of the Climate and Resilience Law on offsetting domestic flights). To this end, it recognises ‘emission reductions’, based on methodologies developed by stakeholders and approved by the Ministry responsible for the energy transition, which can be procured by actors wishing to offset their emissions, thus enabling the financing of projects.

Already 6 methods approved by the Ministry of Energy Transition in the agricultural sector:

- The ‘Carbon Agri’ method, developed by the Elevage Institute, which promotes practices to mitigate GHG emissions and increase carbon storage in the soil of cattle farms and arable crops;
- The ‘Haie’ method, developed by the Chamber of Agriculture of Pays de la Loire, targets the sustainable management of hedgerows;

⁴³https://www.ecologie.gouv.fr/sites/default/files/strategie%20Biodiversit%C3%A9%202030_1er%20volet.pdf

⁴⁴<https://www.ecologie.gouv.fr/label-bas-carbone>

- The 'Plantation de orchards' method, developed by Compagnie des Amandes (Compagnie des Amandes), using emission reductions and carbon storage allowed by planting orchards;
- The 'Large 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 arable crop scale practices (e.g. soil cover or inter-crop);
- SOBAC's 'ECO TMM' method developed by SOBAC and targeting input management;
- The Ecomethane method ", developed by the Bleu Blanc Cœur company, targeting the reduction of digestive methane emissions by feeding dairy cattle.

Several projects have been validated, including a Carbon Agri project, which brings together 300 farmers with a reduction in emissions of 0,139 MtCO₂eq. More than 30 agricultural projects are also being developed. The European Commission communication of 15 December 2021 on sustainable carbon cycles, which aims to support the development of carbon removal solutions, will enable these practices and tools to be developed in a harmonised way at EU level. This Communication proposes an action plan to promote carbon farming and forestry, support new removal technologies and establish a regulatory framework for the certification of carbon removals.

The offsetting obligations for airlines for emissions from domestic flights (Article 147 of the Climate and Resilience Law and implementing decree published on 27 April⁴⁵2022) and for coal 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 food consumption patterns

GHG emissions from food account for around 24 % of households' carbon footprint in France⁴⁶.

The Government included in the Law of 30 October 2018 on the balance of trade relations in the agricultural and food sector and healthy, sustainable and 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** to support a more environmentally-friendly agricultural 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 costs, to all mass 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 benefiting from environmental certification at 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

⁴⁵<https://www.ecologie.gouv.fr/loi-climat-et-resilience-compensation-des-emissions-gaz-effet-serre-des-vols-nationaux>

⁴⁶Barbier et al., 2019. The energy and carbon footprint of food in France, from production to consumption.

by more than four times between July 2020 and July 2021). The Climate and Resilience Act shortened the period for taking into account 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;

- **An obligation for school canteens to offer a vegetarian menu at least once a week**, and the obligation for mass restaurants serving more than 200 per day to implement a multiannual plan for the diversification of protein sources; with effect from the enactment of the Climate and Resilience Law, the introduction of experimentation of a daily vegetarian option in school catering services at the expense of voluntary authorities, and from 1^{January} 2023, an obligation for public catering services to offer a daily vegetarian menu where they usually offer a multiple choice of menus (Article 252 of the Climate and Resilience Law). The aim is to **diversify protein intake by** eating more legumes in line with the objectives of the National Nutrition Health Plan 2019-2023⁴⁷; The challenge is therefore to encourage the development of a local French supply to meet this growing demand.
- **The objective of deploying territorial food projects (TAPs)**, enshrined in the Climate and Resilience Law (Article 266), which lays down a target of at least one PAP per department on¹ January 2023 (achieved from 2022), but also broadens the objectives assigned to PAP and provides for a support mechanism through a national network of PAP. Strongly supported by the Recovery Plan, the deployment of PAP has grown particularly significantly in recent years. On 1^{April} 2023, there were almost 430 PAP recognised by the Ministry of Agriculture and Food, the majority of which are in an emerging phase, requiring substantial 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 other sectors. To this end, through the successive application of the Garot⁴⁸, EGAlim and AGECL laws, the prohibition on rendering foodstuffs still consumable unfit for consumption and the obligation to propose a donation agreement to an authorised association (for structures above a certain threshold) applies to the agri-food industries, distributors, wholesalers and mass catering sectors. 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 AGECL law in 2020, with effective implementation in 2022 for local GMS and shops, wholesalers and mouth trades. In addition, an experiment has been carried out since 2022 to assess the effects of food reservation solutions in mass catering on the development of food waste, attendance rates and user satisfaction;
- **The implementation of environmental labelling on food products**, following an experiment involving 18 projects in 2020 and 2021, as provided for in the AGECL law and subsequently the Climate and Resilience Law. This initial work is intended to continue in order to develop the

⁴⁷In France, the consumption of dried vegetables (lentils, beans, beans, beans, chickpeas, etc.) has been divided by 4 in twenty years, reaching 1.7 kg/person/year compared to the European average of 3.9 kg. The National Nutrition Health Programme (PNNS) recommends increasing the consumption of legumes (at least 2 times a week) due to their high fibre content.

⁴⁸<https://www.legifrance.gouv.fr/loda/id/JORFTEXT000032036289/>

⁴⁹<https://www.legifrance.gouv.fr/loda/id/JORFTEXT000041553759/>

methodology in order to better integrate carbon storage and production models. The purpose of this display is 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 of the same category, in order to illustrate the level of performance of an ecodesign benchmark compared to a similar offer.

- **The State has decided not to purchase goods that contributed directly to deforestation** (Article 272 of the Climate and Resilience Law). With this in mind, the full traceability of the supply chains of imported agricultural raw materials has been improved through Article 271 of the Climate and Resilience Act). This work is continuing at European level in order to provide customs with the necessary information to combat imported deforestation. The development of demand for non-deforestation products accompanies the national plant protein strategy as the development of protein crops and fodder legumes in France would limit the use of imports from deforestation. The guide for public procurement not from imported deforestation has been updated. Furthermore, as requested by France, the European Commission proposed in November 2021 new rules to halt EU-driven deforestation. The regulation would set out the rules for mandatory due diligence for companies wishing to place certain products on the market (commodities such as soya, beef, palm oil, wood, cocoa and coffee), with the aim of ensuring that only products that are legally compliant and unrelated to deforestation are allowed on the European market.
- **The target of 8 % of utilised agricultural area cultivated with legumes by¹ January 2030** (Article 261 of the Climate and Resilience Law).
- The introduction of a new National Strategy for Food, Nutrition and Climate (SNANC), foreseen under Article 265 of the Climate and Resilience Law, which introduces a new comprehensive food governance, which is being developed through broad stakeholder consultation.

These measures are the subject of **financial support** as part of the French recovery plan, which allocated EUR 816 million to accelerate the agro-ecological transition to promote healthy, sustainable and local food, including more than EUR 150 million to increase plant protein production and EUR 200 million for food. In particular, the Plant Protein Strategy foresees a campaign to promote the consumption of legumes for young people, directly or indirectly through their parents, mass catering or health professionals, to be implemented in 2022. This support continues with the implementation of the acceleration strategies 'Sustainable agricultural systems and agricultural equipment contributing to the green 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), as part of the National Council of Industry, the Strategic Agri-Food Chain Contract (CSF) was signed on 16 November 2018. In particular, it includes a project for the development of plant proteins in the diet (protein project of the future). Through support for R & D projects, public communication, pre-standardisation and regulatory monitoring, as well as support for start-ups, the aim is to encourage the production of complementary sources to animal proteins in response to a growing protein demand of 40 % by 2030. Some of the actions under this component were supported under France relaunch and then France 2030.

- **SNBC Guidance**

The draft SNBC 3 sets out the following strategic guidelines for the agriculture sector:

- ✓ Changes in production methods through the development of pathways to mitigate GHG emissions, adapt agriculture to climate change and food sovereignty
- ✓ Encouraging transition dynamics at regional level in a contractual logic, involving all parts of the food system
- ✓ Support for the reduction in the use of mineral nitrogen fertilisers
- ✓ Evolution of cattle population
- ✓ Herd management and farming systems
- ✓ Management and valorisation of animal waste
- ✓ National Food, Nutrition and Climate Strategy
- ✓ Incentives to consume organic, local and seasonal products and legumes
- ✓ Combating food waste
- ✓ Phasing out fossil fuels for agricultural machinery and deployment of less energy-consuming cultivation routes
- ✓ Establishment of accompanying financial arrangements to improve the energy efficiency of equipment and buildings (including greenhouses)
- ✓ Support for agricultural methanisation of livestock manure or crop production not otherwise recovered
- ✓ Sustainable management and enhancement of hedgerows and development of agroforestry
- ✓ Developing carbon farming levers
- ✓ Sustainably developing the storage potential of hedges and intraparcellar agroforestry
- ✓ Fostering carbon storage in soils

Cross-cutting measures

- **Planned policies and measures**

Policies and measures affecting all sectors

Policies and measures affecting all sectors are those affecting businesses and communities. They are also likely to affect all greenhouse gases.

Even before the European Directive on ESG reporting for companies in 2022, France had a leading policy in this area, with first transparency obligations introduced in 2001 and regularly strengthened since then.

Since 2012, an obligation to produce **a balance of greenhouse gas emissions** and an action plan to reduce them applies 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. This is an organisation-wide (private or public) approach to diagnosing greenhouse gas emissions with a view to identifying and mobilising sources of emission reductions. Since Decree No 2022-982 of 1^{July} 2022, the rules have made it compulsory to calculate all significant direct (scope 1) and indirect emissions (scopes 2 and 3) for a large part of those obliged. A methodological guide for carrying out the stocktaking is made available to organisations free of charge. In addition, an internet platform for the publication of the reviews was set up in 2015 to facilitate the publication and dissemination of this information to the public.

Corporate social, environmental and societal responsibility duties have been reinforced by the Act on Energy Transition for Green Growth of August 2015, 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 ending 31 December 2016. The concept of significant emission items was thus used to encourage the company 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 information on 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, 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 assist businesses in implementing 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 obligation to declare non-financial performance (DPEF) and which benefit from State contributions under the emergency plan put in place by the Government to respond to 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 broken down 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 the establishment of a simplified balance of greenhouse gas emissions for legal persons governed by private law receiving credits under the recovery plan following the health crisis. This report is different from the scheme for greenhouse gas emission balances (BEGES), framed by Article L. 229-25 of the Environmental Code, both on the perimeter of obligors and the perimeter of emissions to be taken into account:
 - This applies only to companies 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 needed for the activities of the legal person shall be estimated.

Furthermore, Decrees No 2022-538 and No 2022-539 of 13 April 2022 provide that, from 1^{January} 2023, advertisers will be prohibited from stating in an advertisement that a product or service is 'carbon neutral' without presenting a balance on the life cycle greenhouse gas emissions of the product or service, the planned emission reduction trajectory and the arrangements for offsetting residual emissions. These elements should be easily accessible to the public and updated annually. This scheme, 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 planning, sustainable development and territorial equality plans (SRADDET) for the regions, and the Regional Climate and Air Energy Plans (PCAET) for inter-municipal authorities with more than 20 000 inhabitants. PCAET and SRADDET are the tools for coordinating the low-carbon transition in the regions. As real projects for the sustainable development of territories, they define strategic and operational objectives to mitigate and adapt to climate change, to develop renewable energy, to control energy consumption and to improve air quality, in line with national objectives.

Cross-cutting policies and measures on fluorinated gases

Regulation No 517/2014 ('F-Gas II') introduces a number of provisions to reduce F-gas emissions from refrigeration and air-conditioning equipment used in buildings, industry and refrigerated transport. It entered into force^{on} 1 January 2015 and repeals and replaces Regulation No 842/2006 ('F-Gas'). It is based on the following provisions:

- Strengthening the obligations relating to the containment of equipment (leak checks, repair obligations), the certification of personnel handling HFCs, and the obligation to recover during the maintenance and dismantling of equipment;
- The introduction of a phase-down mechanism for the quantities of HFCs placed on the market from 2015 to 2030 through a quota system. In 2030, the total quantity of HFCs placed on the market, equivalent CO₂, shall correspond to 21 % of the average level between 2009 and 2012;
- Sectoral bans on the placing on the market of products and equipment containing fluorinated greenhouse gases exceeding a certain global warming potential (GWP);
- The prohibition on the maintenance of refrigeration installations with new GWP fluids of more than 2 500 from¹ January 2020.

The revision of this F-Gas Regulation is being launched in order to further reduce the production and placing on the market of fluorinated greenhouse gases in the EU. The proposal currently under discussion between the Member States provides for a 95 % reduction in the placing on the market of HFCs by 2030 compared to 2015 (compared to 80 % under the current F-Gas Regulation).

In addition, France ratified the Kigali Amendment to the Montreal Protocol on Ozone Depleting Substances on 29 March 2018. While the Kigali amendment broadly supports the same objectives as the F-gas II Regulation, it covers a larger commitment period until 2036 (F-gas II until 2030).

- **SNBC Horizontal Guidance**

SNBC 2 sets out cross-cutting orientations on carbon footprint, economic policy, research and innovation policy, urban planning, spatial planning and dynamics, education, awareness raising and citizen ownership of challenges and solutions. These topics will be refined in the final version of SNBC 3.

Carbon footprint:

- ✓ Better control of the carbon content of imported products

- ✓ Encouraging all economic actors to better control their carbon footprint
- ✓ Encouraging citizens to better control their carbon footprint

Economic policy:

- ✓ Send the right signals to investors, especially in terms of carbon prices, and give them the necessary visibility on climate policies
- ✓ Ensuring a just transition for all
- ✓ Supporting European and international actions on finance and carbon prices consistent with the Paris Agreement
- ✓ Foster investment in low-carbon transition projects, by developing financial tools to limit investors' risk-taking and by defining robust criteria for determining which projects are conducive to the low-carbon transition.
- ✓ Develop the analysis of the climate impacts of actions financed by public funds and public policies in order to make it a decision-making criterion. Ensure that actions contrary to our climate objectives do not benefit from public funding.

Research and innovation policy:

- ✓ Developing low-carbon innovations and facilitating their rapid dissemination, building on basic and applied research

Urban planning, planning and territorial dynamics:

- ✓ Containing land take and reducing carbon emissions from urbanisation

Education, awareness and ownership of issues and solutions by citizens

- ✓ Enrich and share a 'low-carbon' culture
- ✓ Supporting citizens in their own low-carbon transition
- ✓ Ensure the social acceptability of public policy measures stemming from the SNBC

Policies and measures to ensure compliance with Regulation (EU) 2018/841

The first national low-carbon strategy adopted in 2015 and the second 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 soils 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 agri-ecological project for France, on the one hand, and the dynamism of forest management on the other. In particular, as regards the forest-wood sector, four levers are identified as complementary:

- carbon sequestration in the forest ecosystem.
- carbon storage in wood products and wood-waste products
- substitution of energy-intensive materials with bio-based products

— the energy recovery of bio-based products or of waste from these products which replace fossil fuels;

Planned policies and measures

The main effect of the measures presented in this section is to reduce CO₂ emissions or contribute to carbon storage through CO₂ removal.

Carbon storage schemes 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.

The **France Relance plan promotes the increase in carbon farming through the ‘Bon Diagnostic Carbone’ and ‘Plantons des Haie’ actions.** The ‘Bon Diagnostic Carbone’ scheme in the France Relance plan aims to encourage newly established farmers (for less than 5 years) to reduce their GHG emissions and store carbon while adapting their farm to climate change. Its implementation consists of financing structures that support 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 targets 5000 “good carbon diagnostics”. On 1^{January} 2022, there were 757 signed vouchers, with 177 diagnoses carried out giving rise to 43 refunds to farmers. As explained above, the “Plantons des hedges” scheme aims to support the planting of 7 000 linear km of hedges and the alignment of intraparcellar trees on agricultural parcels. Backed by an envelope of EUR 50 million, it is broken down at regional level and into two components. On the one hand, support for animation, including general awareness of the mushroom tree and technical support for the implementation of planting projects, aimed at operating structures in the area. On the other hand, investment aid, with support for the planting of hedges and the alignment of intraparcellar trees. In 2021, EUR 24,5 million is foreseen for the commitment, which would represent approximately 2 800 linear km of planted trees. Calls for investment projects will continue in 2022.

In **the fight against land take**, in line with European objectives, the Climate and Resilience Law included the objective of achieving ‘net-zero land take’ in 2050 and set a first intermediate step in 2031 to reduce the consumption of natural, agricultural and forestry areas (i.e. the rate of land take between 2022 and 2031 must be divided by two compared to the period 2012-2021). For regions covered by a regional plan for development, sustainable development and equality of territories (all regions outside Corsica and IDF), the reduction at regional level must be at least 50 %. In order to monitor this trend, a land take observatory was set up in 2019. The decrees implementing the law defining the content of the three-year plans and balance sheets to be drawn up by local authorities are in the process of being published.

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 actors (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 in food security and the fight against climate change.

It aims to publicise or implement concrete actions on soil carbon storage and the type of practices to achieve it (agro-ecology, agroforestry, conservation agriculture, landscape management, etc.).

The Common Agricultural Policy (CAP) 2014-2022 includes various measures supporting carbon storage in soils and biomass:

- **Greening** which contributes to maintaining a ratio of permanent grassland, to a crop diversification requirement, and to having 5 % of the arable land area of the agricultural holding as ecological focus area;
- The **Natural Disability Compensation Allowance (NHCI)**, by making a major contribution to the maintenance of extensive grassland, is an important lever for the preservation and storage of carbon in cropland and grassland soils;
- Cross-compliance provides for several **good agricultural and environmental condition (GAEC)** and several **statutory management requirements (SMRs) that promote a stronger return to the soil of organic matter**, grass surfaces or environments conducive to the diversity of animal and plant species (maintenance of hedges, mares and jars) and therefore better adapted;
- **Coupled support under the first pillar** to accompany the production of legumes can help to store organic matter by maintaining soil fertility. The three greening components promote organic matter inputs, grass areas or woody cutlery, beneficial for carbon storage, as well as diversity, which is a source of better adaptation;
- Climate action on agricultural soils also involves **agri-environment-climate measures (AECM)**.
- Under the second pillar, the **technical assistance component of the National Risk Management and Technical Assistance Programme (PNGRAT)** is mobilised to improve soil knowledge (regional soil benchmarks) and several measures under the **Regional Rural Development Programmes (RDPS)** contribute to improving the carbon content of agricultural soils.

The NSP 2023-2027 also promotes carbon farming, 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 ecoregimen consist of reducing the ploughing of permanent grassland, diversifying crops in arable and mixed farming systems, and establishing inter-row vegetation cover into perennial crops. In addition, the 'sustainably managed hedgerows' bonus remunerates holdings with a minimum of 6 % of hedgerows on their holding and having a certificate attesting their sustainable management.

Measures for intra-parcel agroforestry and hedgerows are also important levers to foster carbon storage in both soil and plant biomass and to enhance the added value of the agricultural sector. **The agroforestry development plan** launched in 2015⁵⁰ consists of five axes of action: (I) enhance knowledge of agroforestry systems, monitoring, and research actions on agroforestry; (II) improving the regulatory and legal framework and strengthening financial support; (III) developing advice and training, promoting agroforestry and enhancing its production; (IV) make economic use of agroforestry production and develop them on land and regions; (v) promoting European and international approaches. Following a final evaluation, a new phase of this plan is currently being

⁵⁰<https://agriculture.gouv.fr/un-plan-national-de-developpement-pour-lagroforesterie>

formulated. As part of the France Relance Plan, the government has also set up a programme on hedgerows⁵¹, which encourages farmers **to rebuild hedgerows**. The objective is to plant 7 000 km of hedges and implement the sustainable management of 90 000 km of existing hedges. In addition to this objective, the sustainable management of hedgerows and the encouragement of the development of wooden trees carried out under the AFAC-agroforestry Label Haie and payments for environmental services.

Organic farming also deserves to be mentioned, through its almost exclusive use of organic fertilisers, practices involving more often crop diversification and intermediate cover, its privileged use of grass in livestock farming and/or a greater propensity for agroforestry.

Furthermore, the implementation of **sustainability criteria for bioenergy** prevents the production of agricultural raw materials for energy production on certain carbon-rich soils and biodiversity-rich areas, within the EU or in countries exporting to the EU.

The **Biodiversity Plan**, published in 2018, which aims to implement the objective of reducing net biodiversity loss to zero, proposes actions to limit the consumption of natural, agricultural and forestry areas to achieve net-zero take. In particular, it provides for a review of urban and commercial planning policies in order to halt the increase in artificial areas (buildings, transport infrastructure, car parks, sports grounds, etc.) and to encourage low-volume urban planning.

Carbon storage in forest

French forests currently have an overall positive net contribution to climate change mitigation, with emissions (notably from oxidation of dead wood and sampling) below sequestration. The forest well was -30,4 MtCO₂ in 2020.

The Forest and Wood Assises, held between October 2021 and March 2022, have made it possible to identify, in a concerted manner, the main actions on which to focus in the short term in terms of knowledge, forest renewal, biodiversity conservation, investment in the processing industry, governance, etc. These measures will be taken over and expanded under the **“forest strand” of ecological planning** carried out by the Prime Minister. This planning will also deliver on the objective of replanting a 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 forest renewal (France Relance and France 2030). At the end of the Forest and Wood Assises, sustainable funding has been announced. Dedicated to forest renewal and worth EUR 100-150 million each year, it will be implemented from 2024.

The various policies and measures contributing to enhancing the forest carbon sink include:

- **The tax incentive scheme for investment in forests (DEFI)** encouraging forest owners to take part in a sustainable management of their forest, 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 the over-capitalisation of certain forests, better resilience to storm risk, but also greater mobilisation of wood;

⁵¹<https://agriculture.gouv.fr/francerelance-50-meu-pour-planter-7-000-km-de-haies-en-2-ans>

- The **Forest and Insurance Investment Account (CIFA)** incentivising forest owners to insure themselves against the risk of storm and to make savings to finance prevention and, where appropriate, cleaning and restoring damaged stands. The aim is to improve resilience to climate change and thus maintain forest sequestration;
- **The forest fire control system**, set up each year to protect forest populations and communities. The fight against forest fires starts with the preventive mobilisation of intervention resources and a daily and accurate fire risk assessment. The President of the Republic announced that these resources would be increased following the fires in the summer of 2022.
- The **low-carbon label** created by Decree No 2018-1043 of 28 November 2018 enables the Ministry of Energy Transition to promote the emergence of projects preventing the emission or sequestration of greenhouse gases (GHG) and to promote them, as part of the voluntary or compulsory compensation of public or private actors. Projects sequestering GHG emissions in addition to existing regulations and incentives can thus be labelled and financed by public or private actors, with emission reductions ultimately 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, the eligibility criteria and the additionality criteria and the method of calculating sequestered or reduced GHG. These GHG sequestration projects may concern all sectors of activity, with the exception of activities subject to the European Union Emissions Trading System (EU ETS). Eleven methods have already been approved, three of them in forestry.
- The **National Plan for Adaptation to Climate Change**, which includes forest-related measures. Adaptation to climate change is essential to ensure and secure the forest's carbon sink function.

In addition, a number of cross-cutting schemes aim at both better forest management and greater wood mobilisation:

- **The National Forest and Timber Programme (PNFB)**, established 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 aerial and underground biomass, dead biomass, forest soils, wood products, substitution of wood as an alternative to fossil fuels or competing materials). In particular, it sets an additional target of 12 Mm³ of commercial wood mobilisation 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 PRFBs will include the structural elements of the regional multiannual forest development plans;
- The **inter-ministerial action plan for the recovery of the forest-based sector (PAIFB)**, presented by the government on 16 November 2018. It identifies priority actions grouped into three axes, which concern the mobilisation and sustainable renewal of forests, the development of final markets and support for innovation and investment, the improvement of the environmental performance of the sector and its development in the regions.
- **The strategic contract for forest-based industries (FSB 2018-2022)**, signed by industry professionals and the government, aims to promote the use of wood and strengthen the competitiveness of the sector. 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 plans to develop the use of wood in construction, allowing for long-term carbon storage. An addendum was signed for the years 2021-2022 for the implementation of the recovery plan.

- The **National Bioeconomy Strategy** (adopted in 2017) and its Action Plan 2018-2020 integrate all public policies addressing biomass from the same perspective in order to put the renewable and living carbon economy back at the heart of the economy, replacing fossil and mining products with bio-based products. The action plan divides the bioeconomy strategy into operational actions divided into five axes: improving knowledge; promoting bioeconomy and its products for the general public; create the conditions for meeting supply and demand; producing, mobilising and sustainably transforming bioresources; removing bottlenecks and mobilising funding.
- The Forest and **Woodland 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, in particular broadleaved wood, increasing the performance of the sector, ensuring its adaptation, etc. The launch of a EUR 50 million priority research programme for forest resilience and biodiversity and an agile bioeconomy, a public research programme, was announced on 21 November 2022⁵².

Material wood development

Wood material that is produced and used sustainably requires low 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 these uses would make it possible to increase it. In addition, it can be a substitute for materials that generate greenhouse gases (e.g. concrete, steel and aluminium).

Several devices are planned to promote the development of wood material, especially in construction. **Wooden plans I and II and III (Wood Plan IV covers the period 2021-2024)** have helped to remove technical and regulatory brakes for the use of wood in medium-height construction. The purpose of **the New French Industrial Plan for Large Wood Buildings** is to demonstrate, in a very concrete way through the construction of buildings, the feasibility of building wood at high height and subsequently democratising the most appropriate technical solutions. Finally, **the RE2020** (see section B.2) takes into account all 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 the effort to make significant use of materials of plant and animal origin (wood, hemp, straw, wool, feathers, etc.).

Forest-based industries also benefit from several **financing schemes managed by the French public investment bank Bpifrance**⁵³: the Wood Participatory Development Loan (PPD) and the Wood Pillar Loan for financing at the bottom of the balance sheet, the Wood Fund for investments at the top of

⁵²<https://agriculture.gouv.fr/filiere-graines-et-plants-forestiers-plus-de-50-millions-deuros-pour-batir-lavenir-de-la-foret>

⁵³<http://bois.bpifrance.fr/>

the balance sheet. They also benefit from an accompanying mechanism, the Bois Pillar Bois Accelerator, including advice, training and matchmaking to facilitate their growth.

Prevention and control of forest fires

The State and public establishments such as the National Forestry Office will ensure that forest management is gradually adapted to the foreseeable increase in fire risks in terms of frequency of occurrences and areas concerned, both in mainland France and overseas, by mobilising all forest stakeholders, including the competent local and regional authorities. Coherence will be ensured between the mitigation and adaptation potential of forest management or conservation policies and the recovery and recycling of wood and biomass. The aim is to contribute to reducing the risk of fires and increasing resilience to it, with fires having a very negative impact on the carbon balance of forests and the resilience of ecosystems.

On 10 July 2023 France adopted a law to strengthen the prevention and control of the intensification and extension of the fire risk. The main measures put in place are:

- Extensification of the obligation to draw up a forest fire protection plan in departments whose wood and forests are merely classified at risk
- Better regulation of forest-urban-infrastructure interfaces by strengthening legal obligations for scrubbing (OLD). The perimeter of the LOs will have to be annexed to the local urban planning plan and the fine for non-compliance with the LOs will increase from EUR 30 to EUR 50 that has not been cut off.
- Improving the management of forest areas by introducing a pre-emption right by municipalities on forest parcels without a sustainable management plan and identified as being at risk. In addition, the threshold requiring a simple management plan for a plot of land has been reduced from 25 to 20 ha in order to allow for an increase in the management of private forest areas and their development.
- A ban on smoking in all wood and forests and up to a distance of 200 metres from them during the period at risk of fire defined by prefectural decree.
- Financing the restoration of more resilient forests through the packaging of public support: choice of suitable species, maintenance of firewall areas in areas at risk of fire, etc.

▪ SNBC Guidance

The draft SNBC 3 sets out the following strategic orientations for the land sector:

- ✓ Development and improvement of forestry management
- ✓ Adapting by accelerating forest renewal
- ✓ Encourage afforestation and reforestation
- ✓ Strengthening firefighting capacity
- ✓ Strengthening the resources of state operators and supervisory bodies
- ✓ Develop methodologies to improve carbon accounting in forests
- ✓ Preserving biodiversity

- ✓ Reorganisation of the sector as a result of the increase in harvest over the next few years
- ✓ Incentivising the use of wood material in construction and renovation
- ✓ Support for the development and competitiveness of wood processing industries
- ✓ Improved governance of biomass uses
- ✓ Development of recycling and energy recovery of end-of-life wood products
- ✓ Combating illegal clearing
- ✓ Use of existing buildings
- ✓ Ensuring that grassland is maintained

Long-term vision and objective of a transition to a low-emission economy and a balance between emissions and removals in line with the Paris Agreement

France **reaffirms its objective of achieving carbon neutrality by 2050**, i.e. net zero emissions on national territory, a target set by the Government's Climate Plan published in July 2017 and now enshrined in law. **This objective is all the more ambitious as France plans to strengthen it by including from now on French emissions from international aviation and maritime transport (reported out of total in the national GHG inventory).**

A detailed plan comprising objectives, trajectories, policy levers and financial means has been drawn up for 2030. This was the Government's priority as an essential first step in putting the country on the right path towards achieving our climate and energy objectives. The 2050 horizon is by definition subject to more uncertainty, and the trajectories set for that horizon will necessarily need to be updated in the coming years. Having said this, 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 ecological planning under the Prime Minister's leadership. The 2050 trajectories currently working with stakeholders will be subject to public consultation in the coming months, and can then also be transmitted to the Commission as part of the INECP development process.

In addition, ecological and energy planning ensures that the **"closing" challenges of the scenario** (biomass: balance between supply and demand on national territory, energy: balance of production/consumption, etc.) **as well as our energy targets** (final energy consumption reduction target of the Energy Efficiency Directive, etc.).

Finally, the government is working on a **carbon footprint reduction trajectory** to be consistent with the Paris Agreement, i.e. compatible with limiting global warming to 1.5 °C. The first estimates suggest that the target could be a **80 % reduction in our carbon footprint in 2050**.

3.1.2. Low carbon energy

To achieve the objectives described above, for onshore renewable energy, the EPP will include the following measures:

Measures for electric renewable energy:

- Mobilise all the facilities offered by the law for the financing of renewable energy, and test the principle of mixed tenders (part of production in addition to remuneration, and part of PPP without support) and further develop guarantees for the counterpart risk of PPPs. Maintain the rate of development of onshore wind at least 1.5 GW/year with the objective of a balanced distribution between territories and a fair distribution between onshore and offshore wind for the needs of the electricity system.
- Increase the rate of solar development to at least 5.5 GW/year with a target of 7 GW/year,
- Work towards a balanced distribution of PV between large photovoltaic roofs (25 %), floor power plants (65 %) and residential (10 %), taking into account in particular the potentially higher costs of certain technologies and the need to maximise the use of abandoned and anthropogenic land while exploiting the potential of agrivoltaism. The EPP's territorialisation work should be an opportunity to clarify the distribution of ground power plants among the different types of land that can be mobilised.
- Organise a repowering plan to prepare for an efficient renewal of existing renewable parks over the period 2025-2035 and to provide additional production capacity (exploring possibilities for increasing the size of towers to create a more competitive environment for onshore wind and to limit the number of towers in order to improve the location of wind turbines);
- Increasing incentives for residential or corporate consumption to self-consumption;
- Support and speed up planning at local level, supporting local authorities in the process of defining renewable energy acceleration areas provided for by the 2023 Law and regions in their ownership of regionalised objectives within their spatial planning policy;
- Build the regulatory framework for agrivoltaism pursuant to Article 54 of the Renewable Energy Acceleration Law to enable and encourage its development;
- In addition to the scheme 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 easements by military and weather radars;
- Support projects to relocate key industrial sectors of the energy transition (solar, onshore and offshore wind, geothermal, heat pump, network industry), as a follow-up to the working group on the reindustrialisation of renewable sectors launched in 2023, formalising for each key sector a sector pact, along the lines of the offshore wind pact, and mobilising all possible facilities under the NZIA Regulation to strengthen their strategic autonomy;
- Continue our strategy to secure supplies of critical metals from the energy transition (lithium, nickel, cobalt, copper, aluminium, rare earths, etc.) to control value chains from extraction to recycling. In addition to the support for projects through the France 2030 "Critical Metals" call for projects and the fund created to support these projects, the Green Industries Tax Credit and the investment fund supported by the State and launched in 2023, an update of the

national mining inventory by launching a campaign to recognise the resources of our subsoil will have to be launched in 2024;

- Characterise skills needs and put in place, as part of a co-construction process between the State and the sector, a skills anticipation plan to attract, train and recruit the people needed to meet the objectives.

In order to achieve the various objectives concerning offshore wind (in particular those of the offshore wind pact), it will be necessary to move from a project-by-project approach to comprehensive planning by sea coastline, with the launch in 2023 of public debates on 4 maritime facades, and to identify sufficient areas to:

- Plan from 2024 onwards 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 façade plans are finalised so as to allocate an additional 8 to 10 GW by the end of 2025;
- Anticipate site characterisation studies and initial environmental conditions on the project areas and the works required for the upstream connection of competitive tendering procedures.

For hydropower:

- Increase the hydropower capacity and flexibility of the park (yc. Step), in particular by optimising and overequipping existing developments, in particular by adapting the existing regulatory and economic framework;
- Continue calls for tenders 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.
- With regard to electricity production from bioenergy, biogas has undergone initial developments in the form of cogeneration, but is now primarily geared towards injection into the networks for direct use, as well as the burning of wood, which will be directed primarily at the production of more efficient heat. However, 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 still be possible in specific situations, as well as the production of bioGNV on the farm, in particular where the available biomass is far from the grid connection sites.

The Law on Accelerating Renewable Energy Production, which entered into force on 11 March 2023, reduces the time taken for administrative permit-granting procedures for renewable installations, in line with the guidelines pursued by the Renewable Energy Directive, frees up land for a massive deployment of PV, provides for large-scale maritime façade planning 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 State services on the ground have accelerated project appraisal and support for local elected representatives to connect more projects in the coming years, in particular through prefectural renewable energy contact points in each department. Objectives are being studied for energy communities and the State is actively supporting the development of citizens' projects (bonus

in invitations to tender, legislative provisions in the law on accelerated production of renewable energy (APER), etc.).

These points will be further developed in the final version of the INECP in connection with the implementation of the 2023 Renewable Energy Acceleration Law (APER).

Currently, the bottom-up planning scheme introduced by the Renewable Energy Acceleration Law (APER) is being put in place. The areas identified by the municipalities must make it possible to achieve the objectives of the multiannual energy programming. They are the equivalent of the mapping requested in the Directive. “Go to areas” (or “accelerations areas”) may then be studied, among these areas.

Measures relating to the production of nuclear electricity

EPP 3 could adopt the following detailed guidelines and associated measures:

- continue the operation of existing nuclear power reactors taking into account international best practices, including beyond the deadline of 50 years as long as safety requirements are met and conduct studies to clarify the operational prospects of the existing plant after 50 years and after 60 years;
- increase the available power of existing reactors (*uprating*), in strict compliance with the safety framework and return to the best operational performance levels with the target of returning to nuclear production of more than 400 TWh by 2030 (including Flamanville 3 EPR), 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 out by EDF, successively in Penly, Gravelines and Bugey, with the objective that EDF could take its final investment decision in 2024;
- further study of 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 innovative small reactors, with a view, at the very least, to enabling the Nuward project to achieve the milestone of a first concrete for a first reference plant in France and, secondly, the realisation by at least one innovative nuclear reactor project supported by France 2030 of a prototype;
- maintain the nuclear fuel processing and recycling strategy for the EPP period and beyond, until the 2040s and continue work on renewing the facilities downstream of the nuclear cycle to allow for decision making, including on the post-2040 strategy, by the end of 2026 at the latest, and by establishing an economic framework for investments;
- conduct at CEA level, in connection with the French nuclear sector, a programme of investments in nuclear research infrastructures in order to maintain research capacity in the nuclear sector at the forefront of all the priorities of the Government’s nuclear policy;
- ask EDF in relation to 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 thermal renewable energy:

In order to develop renewable heat, the government has three main, widely tested devices:

- 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.

Set up in 2009, the Heat Fund, managed by ADEME, enabled the massive deployment of renewable heat production installations on French territory. During this period, this investment aid supported more than 7100 projects amounting to EUR 3,68 billion of aid out of EUR 12,4 billion of investment and an annual production of 42.6 TWh of ENR & R heat. Increased by 40 % in March 2022, to reach EUR 520 million for the whole of 2022 and EUR 595 million for 2023, it will be increased again in 2024 to EUR 820 million.

The main measures worked are as follows:

- Set a budgetary trajectory for the Heat Fund which is consistent with the needs of our energy strategy and makes it possible to support the development of all sectors and the deployment of district heating networks, which can be based on the initial budgetary developments planned from 2024 (EUR 820 million), increase ADEME staff in order to accompany the start-up of the Heat Fund and seek new ways of simplification to speed up the deployment of projects;
- In order to reach the target of 200 000 efficient renovations in 2024 and speed up the exit of heat passoires, a 50 % increase in the resources allocated to energy renovation of housing is planned in 2024 to reach EUR 5 billion, as well as the extension of the zero-rated eco-loan until 2027;
- Promote support for renewable heat projects by private individuals in **France Rénov'**;
- Launch a plan to increase **human resources and skills** for renewable heat occupations;
- Strengthen local and regional animation by generalising **renewable heat workers** that accompany projects by local authorities, businesses, etc.

For solid biomass:

- Prioritising uses by prioritising those that are not substitutable by other renewable energy sources, in particular with regard to the decarbonisation of industry and by prioritising short supply chains (a sectoral logic to be adopted for forest biomass, the wood industry being at the forefront of benefiting from the co-products it generates). It will also involve working on the best solutions exploiting locally available biomass resources.

For geothermal energy:

- Continue to implement all parts of the geothermal plan in metropolitan areas;
- Promote geothermal energy as part of the school renovation plan.

For solar thermal:

- Generalising solar thermal cadastres;
- Launch calls for projects from the Heat Fund “Large solar thermal installations”.
- Launch a national solar thermal plan similar to the geothermal plan.

Measures for the development of district heating networks:

- Generalise feasibility studies for all inter-municipal authorities with more than 10 000 unequipped inhabitants;
- 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;
- Support efficient rural networks to valorise forest biomass, geothermal and solar heat available on their territory;
- 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 (ranking of networks);
- Integrating strong objectives for connection to heat 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), making State/public funding conditional on these commitments and strengthening them.

Industrial and tertiary waste heat recovery measures:

- Require a study of the recovery potential for all existing industrial installations of more than 10 MW and new industrial installations of more than 5 MW and explore with stakeholders the feasibility of a guarantee fund to subsidise a biomass heat installation in the event of failure of a waste heat supplier;
- Carry out feasibility studies on the recovery of nuclear waste heat by operators;
- Increase the potential for heat recovery on waste water (networks, treatment plants): support for the development of technologies, feasibility studies (mandatory for large installations according to thresholds to be defined), projects under the Heat Fund.

Biogas measures:

- Define an obligation trajectory for the 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 the cost of consumers in the context of a general increase in gas prices (including housing in the carbon quota mechanism and increasing network cost with reduced gas consumption). Determine the level of public support for small installations (by tariff order) and the largest installations (by tender), the latter being cheaper and more easily close to the gas transmission network but requiring the transport of biomass to these methanisers.

- Reduce the proportion of dedicated crops authorised for methanisation (now set at 15 %), so as not to increase in absolute terms the volume currently used in France and extend this provision to all renewable gases.
- Develop a programme to support new biomethane technologies (pyrogasification, hydrothermal gasification), starting with industrial-scale demonstrators, prioritising them towards resources that are difficult to mobilise (sewage plant sludge, wood waste, etc.).

Hydrogen measures:

New support schemes:

- (1) a support mechanism for decarbonised hydrogen production through calls for tenders, whose terms of reference were under consultation until 20 October 2023, to support projects not only in CAPEX but also in OPEX, since three quarters of the hydrogen costs are those of electricity used, up to 1 GW;
- (2) An Incitative Tax on the Use of Renewable Energy in Transport (TIRUERT) could be extended;
- (3) A tax or an Incitative mechanism at the Azote Climate Impact Fund (TIBICA/MIBICA) will be introduced to encourage the gradual adoption of less carbon solutions while creating fair competition between fertilisers produced in France and abroad and ensuring support for virtuous agricultural practices.

Measures on biofuels and synthetic fuels:

- Mobilise public support to facilitate the installation of first industrial locations for the production of advanced biofuels, in particular for aviation and maritime;
- Set a multiannual trajectory of fuel incorporation targets to achieve a 14.5 % reduction in transport greenhouse gas emissions by 2030. A consultation on this path was launched in July 2023;
- Adapting oil logistics to the development of biofuels by building up strategic stocks of biofuels;

Directing consumption towards fuels with very high biofuel content (B100, etc.) and gradually targeting them towards sectors which will have few sustainable alternatives (heavy construction equipment, agricultural and forestry machinery, air transport, maritime transport, fisheries, etc.).

Development of biomass energy

Energy wood can be harvested as a co-product of timber, respecting the hierarchy of uses. It is therefore interesting to recover the associated timber and industrial timber harvesting products, sawmills and certain wood waste in the form of heat. More generally, developing the recovery of biomass in the form of energy can reduce GHG emissions in different sectors of activity when it is used as a substitute for fossil fuels. The choice has been made to report the measures for the development of energy biomass in this forest section (rather than in the energy section) as they are complementary

to measures aimed at ensuring sustainable forest management. Public policy on forests and timber aims to take forest upstream and downstream into account 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 2018⁵⁴. It sets out recommendations to improve and increase the mobilisation of domestic biomass, to cover, as far as possible from domestic resources, the identified biomass needs, both for energy purposes and for construction or biomaterials and green chemistry. This **national strategy is now reflected at regional level** by the regional biomass schemes provided for in Article L. 222-3-1 of the Environmental Code⁵⁵.

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 sustainable management of ecological infrastructure, etc.), implementation of the ‘hedge pact’, development of the low-carbon label for hedgerows (existing method) and intraparcellar agroforestry (future method), strengthening the methanisation of livestock manure, tightening up controls on the rules governing the feeding of methanisers to increase interest in CIVE cultivation, etc.
- For forest biomass: permanent financing of the renewal of forests and support for the development of the sector (forestry works, seeds, nurseries), protection of forests against fire (legal obligations to remove scrubbing, monitoring, first intervention, combating), combating fragmentation and encouraging the grouping of management, putting a greater proportion of private forests into management, boosting increases, 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 law and for a circular economy (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 section on Energy) has supported many biomass heating 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 Mtoe⁵⁶. In addition, two **DYNAMIC Wood** 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.

The production of electricity from solid biomass is supported by contractual arrangements resulting from **past tenders**. Support schemes are now focusing on support for renewable heat.

In addition, MaPrimeRénov’ devices (see Section 3.1.2. Residential/tertiary), energy savings certificates (see Energy section) and zero-interest eco-loans (see Residential/tertiary section) support the development of energy wood among individuals.

⁵⁴ This strategy will be updated to take into account the new EPP and SNBC objectives.

⁵⁵ These documents specify the concrete measures to be implemented, as well as the regional targets for mobilising new resources. The objectives set at regional level will allow the SNMB to be adjusted accordingly.

⁵⁶<https://fondschalear.ademe.fr/>

3.1.3. *Other elements of the decarbonation dimension*

National policies and measures affecting the EU Emissions Trading System (EU ETS) are:

- Support measures for renewable energy (including: calls for tenders from the Energy Regulatory Commission, Heat Fund);
- Measures to promote sobriety and energy efficiency (in particular: energy transition tax credit, energy saving certificates);
- Calls for projects to support industry decarbonisation (e.g. DeCarb IND, BCIAT 2021, etc.), as well as the carbon contracts for difference scheme mentioned above;
- measures to decarbonise the building and transport sectors for 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. For this reason, for example, the energy saving certificates scheme was extended to ETS installations in 2019 or several calls for projects to support the decarbonisation of industry were launched in the framework of France Relance (the French strategy for the recovery of the economy from the COVID crisis, partly financed by the EU RRF).

3.1.4. *Policies and measures to achieve other national targets, where applicable*

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), which can feed into the update of the INECP.

3.4.1.4. **Coherence between mitigation and adaptation**

In areas where adaptation and mitigation are strongly linked (e.g. forest, energy production and consumption), it is planned to identify possible co-benefits and trade-offs. This is a highly identified issue in the context of the preparation of SNBC 3. SNBC 3 thus ensures that the future climate is better taken into account in its forward-looking work and measures in conjunction with the preparations for the future PNACC.

3.1.4.2. **Territorial articulation of adaptation policy in metropolitan and overseas areas**

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 the territorial planning documents specific to each of the outermost regions, will include measures to promote adaptation to climate change. Through the mobilisation of appropriate tools, these actions will aim to strengthen 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.

3.1.4.3. **Soil**

Soil contributes to atmospheric carbon sequestration. In the context of the Biodiversity Plan, the Ministry for Ecological and Solidarity Transition (MTES) will limit land take and sealing, seeking to stop it in the long term, using the various tools that can be mobilised at national level, in spatial planning

(e.g.: Territorial coherence scheme, local inter-municipal urban planning plan) or project plan (e.g.: change of practices, recycling of brownfield sites after restoration); and will explore the possibilities of bringing anthropogenic territories back to nature, or even restoring them to culture (e.g.: remediation, restoration of brownfield sites). The Climate and Resilience Act sets new objectives.

3.1.4.4. Laws, codes, standards and technical regulations

The technical benchmarks will be reviewed by the relevant departments and adapted as necessary, giving priority to the infrastructure and equipment sectors of the transport networks (reliability and climate 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 a favourable framework for adaptation.

The building will be gradually adapted to climate change to foster resilience to both natural and health risks in urban planning incorporating climate change.

3.1.5. *Policies and measures to achieve low-emission mobility (including electrification of transport)*

3.1.5.1. Planned policies and measures

Measures to reduce CO₂ emissions from transport

The measures implemented to reduce CO₂ emissions from_{transport} aim to massively increase the share of low-emission vehicles in the fleet, improve vehicle energy efficiency, promote the development of biofuels, increase vehicle occupancy and support modal shift.

Measures to reduce greenhouse gas emissions from transport have been reinforced since 2019, notably through the Mobility Orientation Law and the Resilience Climate Law.

Developing low-emission vehicles and improving the energy efficiency of new road transport vehicles.

The National Bas-Carbone Strategy (SNBC) aims to decarbonise vehicles by promoting the gradual electrification of the vehicle fleet for passenger cars; for heavy-duty vehicles, the development of a mix that is more diverse according to usage (electrification, in particular for heavy mobility, using fuel cell solutions with decarbonised hydrogen, development of biogas vehicles with encouragement for the development of renewable gas as a transitional solution).

Measures related to the decarbonisation of vehicles are both legislative and regulatory (European regulations setting CO₂ emission performance standards for new vehicles, targets for ending the sale of 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 measures (including bonus-malus at purchase, conversion premium) and include measures for the development of recharging and deployment infrastructure for low-emission zones.

Passenger cars

With regard to cars, **successive EU regulations** have imposed emission reduction targets on sales of new cars. A first regulation of 2009 amended by a 2014 regulation thus required car manufacturers to lower the average CO₂ emissions limit for new passenger cars to NEDC 130 gCO₂/per km in 2015 and 95 gCO₂/per km NEDC in 2020 (this target being translated into WLTP in 2021). Regulation No 2019/631 of 17 April 2019 provides for a tightening 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, the provisional agreement reached at European level includes emission reduction targets of 55 % in 2030 and 100 % in 2035 compared to target 2021, i.e. an end to the sale of new combustion engine cars in 2035.

At national level, targets for the incorporation of low-emission vehicles (electric or plug-in hybrids) in **fleet renewal have been set since 2015 for fleets** run by the State, its public establishments and mass caterers, as well as for car rental companies and operators of taxis and cars with drivers (PHVs). The Mobility Orientation Law (2019) provided for a strengthening of the targets to be achieved and for the introduction of a new target for ultra-low emission vehicles (electric or hydrogen) for public fleets and an extension of the scope of the measure to private companies directly or indirectly managing fleets with more than 100 vehicles. The Climate and Resilience Law set an increase in the target of purchasing low-emission vehicles during fleet renewals to 70 % from 2026 onwards for the State (instead of 50 %), 40 % from 2025 and then 70 % from 2030 for local authorities, 40 % from 2027 and then 70 % from 2030 for private fleets and fleet rental companies with more than 100 vehicles. The transposition of the Propres Vehicles Directive (2019/1161) in 2021 increased the targets for ultra-low emission vehicles (electric or hydrogen) to 45 % for the State from 2030 (instead of 37.4 %) and to 40 % for local authorities from 2030 (instead of 37.4 %).

At national level, the Climate Resilience Act sets a target of limiting sales of new passenger cars emitting more than 123 gCO₂/per km WLTP (95 gCO₂/km NEDC) to a maximum of 5 % by¹ January 2030.

Various tax and financial schemes aim to encourage the acquisition of low-emitting vehicles. The Climate Resilience Act affirms the principle of maintaining support/incentive schemes for the purchase of clean vehicles until 2030, as the schemes are designed to be adjusted according to the achievement of objectives and economic conditions.

The bonus-malus scheme, introduced since 2008, aims to reward purchasers of new cars emitting the least CO₂ by means of a bonus and to penalise those who opt for the most emitting models via a tax malus. The amounts and thresholds shall be reviewed periodically in order to maintain the incentive effect of the scheme. In 2023, **the malus** applies to vehicles emitting more than 123 gCO₂/km (in the new WLTP cycle) and corresponds to an increase in the purchase price ranging from EUR 50 to EUR 50 000 (capped at 50 % of the purchase amount including taxes on the vehicle). The more the model emits CO₂, the more malus increases. A weight malus, starting at 1 800 kg, has also been put in place since 1 January 2022 for thermal vehicles and plug-in hybrid vehicles with an electric range of less than 50 km in the city. In 2023, **the bonus** for a new electric car was up to EUR 7 000 for individuals in the first five income deciles, EUR 5000 for the top five deciles and EUR 4 000 for a legal person. 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, shall be paid. Its amount for a new electric car is up to EUR 6 000 for individuals (subject to conditions of resources and mileage) and EUR 2 500 for legal persons.

For persons living in or working in a low-emission zone (ZFE), whose access is restricted for the most polluting vehicles, the State shall grant an additional premium equivalent to any aid paid by the local authority, up to a maximum of EUR 1 000.

The French authorities are planning to set up a leasing scheme, which will allow small households to access an environmentally efficient long-term rental offer of EUR 100 per month, starting on 1^{January} 2024, with a possibility of pre-registration from this autumn.

A microcredit device for the purchase of a clean vehicle allows people excluded from the traditional banking network to buy or hire a low-polluting two-wheeler or quadricycle car, van or quadricycle. 50 % guaranteed by the State, the amount of credit varies according to household income. Since 6 February 2022, its maximum amount has now reached EUR 8 000, reimbursable over seven years, compared with EUR 5 000 reimbursed over five years earlier. Microcredit can be combined with the ecological bonus and the conversion premium.

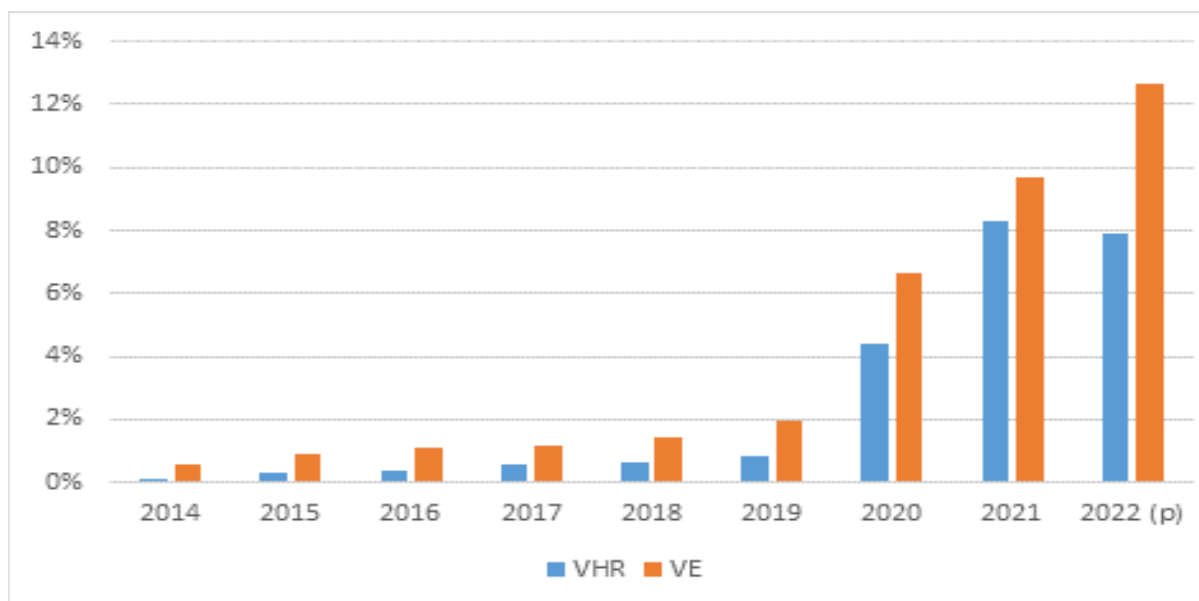
A zero-interest loan experiment has been in place since 1 January²⁰²³ for two years. It will be open to small households and micro-enterprises, who are resident or have a professional activity in the ZFE above air quality standards, or in an inter-municipal association bordering them, for the purchase or rental of low-emission vehicles. The loan can amount to EUR 30 000 (EUR 10, respectively, EUR 000 in the case of long-term lease or lease with option to purchase) repayable over seven years (respectively, the duration of the lease agreement).

Company car tax is an annual tax on passenger vehicles, based on: CO₂ emissions on the one hand; the energy used and the year of entry into service of the vehicle. Other tax advantages exist for low-emission company vehicles such as the increase of the maximum depreciable amount and the reduction of the benefit 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 following graph, the market share of electric cars grew very rapidly from 1.9 % market share in 2019 to 9.7 % in 2021 and 12.7 % in the first ten months of 2022. In 2021, 164 electric cars were sold in France. The share of plug-in hybrid cars also increased from 0.8 % in 2019 to 8.3 % in 2021, before declining slightly to 7.9 % in the first ten months of 2022.

DR



2022 (P): calculation over the first ten months of the year

Figure 29: Evolution of sales of electric (EV) and plug-in hybrid cars (VHR), Source: SDES, RSVERO

Furthermore, the unit emission targets for new passenger cars (95 g CO₂ per km, measured according to the old NEDC certification cycle, from 2020) have been met. The target is set, from 2021 onwards, according to the new WLTP certification cycle, which was introduced to better assess actual emissions.

Light duty vehicles

Regulation No 510/2011 required manufacturers to gradually reduce the average emissions of new light commercial vehicles to NEDC 175 gCO₂ per km between 2014 and 2017. An average emission level of 147 gCO₂ per km NEDC has been set for 2020 (this target being translated into WLTP in 2021). Regulation No 2019/361 of 17 April 2019 provides for a tightening of the targets with a 15 % reduction in emissions from 2025 and 31 % in 2030 compared to target 2021. As part of the Fit for 55 package, the provisional agreement reached at European level includes reduction targets of 50 % in 2030 and 100 % in 2035 compared to target 2021, i.e. an end to the sale of new thermal light commercial vehicles in 2035.

New electric vans benefit from a bonus of up to EUR 7 000 for a natural person (EUR 5 000 for legal persons), up to a maximum of 40 % of the total tax on the vehicle. If the purchase of a less emitter vehicle is accompanied by the scrapping of an old vehicle, and under certain conditions, a conversion premium may also be paid. Purchasers of low-emitting vans are also eligible for zero-interest microcredit and loan schemes (to be introduced from 2023).

Targets for the incorporation of low-emission vehicles in fleet renewal also apply to light commercial vehicles.

Commercial vehicles of between 2,6 and 3,5 tonnes powered by natural gas vehicles, biofuels, electricity or hydrogen benefit from a tax scheme of 20 % of excess depreciation.

Heavy goods vehicles

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 (with an increase to 45 % under

the Fit55 Package) compared to the level of emissions raised in the reference period July 2019 – June 2020.

At national level, the Climate Resilience Act sets a target for ending the sale of new heavy-duty vehicles used for the transport of people or goods powered predominantly by fossil fuels in 2040. Public fleets of heavy goods vehicles are also subject to greening obligations.

There are tax incentives for PL, for the development of GNV and then bio-GNV, electric and H2 vehicles. Heavy goods vehicles powered by natural gas, biofuels, electricity and hydrogen benefit from an overdepreciation facility of 60 % for heavy goods vehicles up to 16 tonnes (and 40 % above). As part of the Recovery Plan, electric and/or hydrogen trucks received a bonus of up to EUR 50 000. In addition to this bonus, a call for projects, known as the 'Electrical Heavy Vehicles Ecosystem', was opened in March 2022. With a budget of EUR 65 million for 2022, it supported projects for the purchase of electric heavy-duty vehicles (with aid of up to EUR 150/vehicle) and the deployment of the associated charging infrastructure. This call for projects was renewed in 2023, with an adapted perimeter and a total of EUR 60 million (heavy goods vehicles and coaches).

Buses and coaches

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 are largely renewable) are set according to the 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), in particular by introducing a target of at least 50 % of zero-emission low-emission vehicles (electric or hydrogen) for the largest agglomerations (more than 250 000 inhabitants).

As part of the recovery plan, electricity and/or hydrogen buses and coaches 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 purchased by companies subject to corporate or income tax under a real tax system. Finally, electric buses and coaches were eligible in 2022 for the call for projects entitled 'Electrical Heavy Vehicles Ecosystem', as was the case for electric heavy goods vehicles (with aid of up to EUR 100 000 per vehicle). As for heavy goods vehicles, the call for projects was renewed in 2023 for coaches.

Charging infrastructure

A set of measures aims to promote the **deployment of charging infrastructure** for electric vehicles. There are requirements for pre-equipment and equipment for certain types of public buildings and car parks (Mobility Guidance Law, Resilience Climate Law).

Financial support is provided for the installation of both public and private charging stations. Individuals setting up home terminals are entitled to a tax credit of up to EUR 300 per charge system and 75 % of expenditure.

The ADVENIR programme, financed under the Energy Economy Certificates (EEC), subsidises the installation of load points in the collective residential sector, enterprises and for public persons within the limits of aid rates and ceilings per recharging point and type of target.

The installation of fast charging stations is supported by the recovery plan until the end of 2022 (on major roads) and the investment plan France 2030 until 2024 (in metropolitan areas and territories). Obligations to ensure the distribution of all the usual sources of energy are put in place for motorway delegates.

The 2021 Finance Act provides for the integration of renewable electricity supplied by publicly accessible recharging infrastructure into the TIRUERT (incentive tax on the use of renewable energy in transport), allowing fuel distributors to value the recharges of electric vehicles in order to meet their targets for incorporating renewable energy. This aims to foster the deployment of publicly accessible recharging infrastructure by improving its cost-efficiency and allowing for part of the operating costs to be borne over time.

In addition, home charging stations benefit from a reduced VAT rate of 5.5 % (ie 20 %) and when the employer provides a charging station, the benefit in kind is considered zero for travel for non-business purposes.

The Mobility Orientation Law and the Climate Resilience Law created and strengthened provisions for the deployment of recharging infrastructure. The Mobility Orientation Law simplified and extended the right to pick-up arrangements in order to facilitate the installation of recharging points in collective 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 master plan for the development of publicly accessible recharging infrastructure for electric vehicles. This is a system which gives the community a role in steering the supply of recharging in its territory, leading to a coordinated offer between the various public and private developers, consistent with local mobility policies and adapted to the needs. The Climate and Resilience Act made these schemes mandatory in the FZEs. The Climate Resilience Act also provides for the possibility to install collective electricity infrastructure (facilitating the subsequent connection of recharging points) in collective buildings at no cost to the owner or co-ownership via the grid operator or a recharging operator, which is reimbursed by contributions from users wishing to connect a recharging point to the collective infrastructure.

The Energy Transition Law for Green Growth sets a target of 7 million public and private recharging points by 2030.

Further work is being carried out on the Light Vehicles Strategy, including terminals at depot or destination and roaming terminals.

The National Hydrogen Strategy

The national hydrogen strategy aims at the development of decarbonised hydrogen and includes a focus on the development of heavy to hydrogenic mobility based in particular on territorial hydrogen mobility ecosystems based on vocational vehicle fleets.

The development of biofuels

The incentive tax on the use of renewable energy in transport (TIRUERT) is a very strong incentive to maximise the uptake rate of biofuels while ensuring the sustainability of their production. TIRUERT is a tax paid by operators who do not meet the national target for the incorporation of biofuels meeting

the sustainability criteria into petrol and diesel. In 2022, the target rate for biofuels is set at 9.2 % for petrol and 8.1 % for diesel.

The incorporation of biofuels into aviation is mandatory for up to 1 % from 2022 (Finance Act). This obligation is part of a biofuel development strategy enshrined in the Biofuels Development Roadmap, which sets an incorporation target of 5 % by 2030. In addition, a call for expressions of interest on sustainable biofuels has been launched to identify investment projects in 2th generation units.

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 (less congestion and air pollution). In 2019, the government set the target of tripling the number of daily car-sharing 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. As such, 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, made it possible to provide an appropriate legal framework for this practice in order to enable it to develop, while clearly differentiating it from the activity of regular public transport, taxis and private vehicles with drivers. The same law allows the authorities organising mobility (AOM), in the event of non-existence, insufficient or inadequate private supply, to make available to the public dematerialised platforms facilitating the matching of offers and requests for car-sharing. Those authorities may also create a distinguishing sign of vehicles in a carpooling situation, after having defined in advance its award conditions.

The 2015 law on energy transition for green growth also provides that businesses and local and regional authorities should, as far as possible, facilitate carpooling solutions for commuting between the home and work of their employees and agents.

The Mobility Guidance Law (2019) provides for the possibility for local authorities to subsidise carpooling offers to make them even more attractive and to make them a fully-fledged solution. The Mobility Guidance Act has created a sustainable mobility package, which allows all private and public employers to contribute to the costs of commuting by car sharing or cycling of their employees. This lump sum may be up to EUR 700/year free of tax and social security contributions.

A carpooling plan was launched in 2023. In particular, the plan includes a premium of EUR 100 for new drivers paid by carpooling platforms to incentivise the start of carpooling; support for car-pools in addition to local authorities on the principle of 'EUR 1 from the State for EUR 1 from the local authority'; mobilising the green fund of EUR 50 million in 2023 to support local authorities in their projects for the development of car-sharing infrastructure (areas, lines or testing of dedicated routes).

Support for modal shift

Support for modal shift towards the least CO₂ emitting_{modes} includes improving the provision of alternative transport services and infrastructure to road, be it urban and interurban passenger transport or freight transport.

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 (HSR): Tours-Bordeaux, Brittany Dutch-la-Loire, the East European LGV, and the Nîmes-Montpellier bypass (mixed passenger and freight line enabling congestion on the Nîmes-Montpellier axis), i.e. 757 km of additional new high-speed lines brought into service between 2015 and 2020. In urban transport, clean public transport has been strongly developed in the major provincial agglomerations over the last 15 years. Since 2008, the State has accompanied the Clean Site Collective Transport (TCSP) projects with the authorities organising mobility by co-financing them through calls for projects. Four calls for projects addressed to transport organising authorities with a metro, tram or high service bus project were launched between 2008 and 2021; the fourth call for projects, dating from 2021, will provide EUR 900 million to finance clean site collective transport projects and multimodal exchange hubs.

In Île-de-France, the Grand Paris Transport project launched in 2013 is intended to improve the public transport service offered to passengers in terms of information and operation of the network, to modernise and develop existing networks, to build a new automatic metro network and to develop a direct link to Paris-Roissy airport. In the long run, it is expected that 90 % of the French population will have access to a station within 2 km. This new network will significantly improve movements from periphery to periphery 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 network regeneration and maintenance investments. The 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 to promote modal shift:

- Strengthening collective and shared transport: a 40 % increase in transport investments between 2014-2018 and 2019-2023 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 mobility data to reach 100 % of the mobility information accessible for a single click journey).

For long-distance travel, and in order to promote modal shift to rail, air transport is subject to taxation on air tickets and an obligation to offset emissions created by the Climate Resilience Act. These measures complement European schemes (ETS and Corsia).

Incentives for cycling

Various measures have been put in place:

- Support for purchase has been put in place: ecological bonus for the purchase of 'electrically assisted bicycles', 'cargo bikes'; conversion premium for the purchase of a new, second-hand electric or cargo bike, in return for scrapping an old motorised vehicle. In low-emission zones, the State grants an additional premium equivalent to any aid paid by the local authority, up

to a maximum of EUR 1 000. The conversion premium is extended to the purchase of one bicycle per person in the home with the same ceiling per bicycle.

- In order to facilitate the parking of bicycles, there is an obligation to put in place secure bicycle parking during the construction of residential and office buildings, or when work is carried out on the car parks, as well as the obligation to put on the agenda of ordinary general meetings of co-owners the issue of works enabling the secure parking of bicycles.
- There are financial incentives for cycling: sustainable mobility package allowing employers to finance the use of bicycles by their employees (up to EUR 700 per year); tax reductions for companies providing their employees with a fleet of bicycles free of charge for commuting (up to a maximum of 25 % of the purchase price of the bicycle fleet).
- A bike fund, with the launch of calls for projects, was created to support and amplify projects for the creation of cycling routes within communities, targeting in particular discontinuities of routes and ensuring the safety of all users. The first cycling plan created in 2018 is extended and strengthened as part of the 2022-2027 cycling and active mobility plan.
- The gradual introduction of bike marking and the development of secure car parks have been put in place to combat theft and recel;
- The development of learning and cycling culture at school has been put in place.

A “sustainable mobility package” allows all private and public employers to contribute to the costs of commuting by car sharing or cycling of their employees. This flat rate currently amounts to up to EUR 700 per year free of tax and social security contributions (EUR 800/year in the case of a combination of the sustainable mobility package and the payment by the employer of the public transport season ticket). The implementation of the lump sum within each undertaking is optional.

Support for rail and inland waterway freight transport

The Resilience Climate Law of 24 August 2021 sets a target of doubling the modal share of rail freight by 2030 from 9 % (in 2019) to 18 %, as well as an increase of 50 % in the modal share of inland waterway transport 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 concrete 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; developing coordination with ports and inland waterways.

For inland waterway freight, an Inland Transport Strategy is being drawn up with the aim of mobilising stakeholders towards achieving the objectives of increasing the modal share of the river.

Combined transport, a transport system that combines road mode with other modes such as inland waterways, rail or short sea shipping, is the subject of financial support. The aid scheme aims to reduce the additional cost of breaks in the intermodal chain compared to door-to-door road transport. This involves the payment of flat-rate aid per intermodal transport unit – UTI (containers, swap bodies, semi-trailers, trailers) transhipped to a land or port terminal situated in mainland France and integrated into a transport chain including a pre- and post-transport road transport at the ends of the main link.

Information for users of transport services

A focus of the policy to support modal shift is to improve information for users of transport services with the GHG information system on transport services. Providers of transport of passengers and goods or removal services must provide information on the quantities of greenhouse gases resulting from the services provided on behalf of their customers.

Urban planning measures

Urban planning measures to promote modal shift and demand-side management are also part of a sustainable mobility policy: rebalancing of the living space in favour of active modes (walking, cycling); urban densification around structural public transport routes; urban policies aimed at functional mix and community-based services for a short distance city; inclusion of urban logistics in planning documents.

Measures acting on several levers

Agglomerations with more than 150 000 inhabitants in metropolitan France will have to have **a low mobility zone in place** by 31 December 2024. For low-emission zones where air quality standards are not met, at least: 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 (EEC), the EVE programme (Voluntary Commitments for the Environment – Transport and Logistics) aims to support transport and logistics actors (carriers, freight forwarders and shippers) in improving their energy and environmental performance. It is based on three schemes of voluntary commitments: Objective CO₂ for freight and passenger carriers, fret21 for shippers and EVcom for freight forwarders.

- The Objective CO₂ scheme, resulting from the commitment charter launched in 2008, provides for the provision of tools for assessing GHG emissions for the establishment of an action plan over 3 years of their reduction, based on 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 actions to reduce their emissions over 3 years along 4 axes: load ratio, distance travelled, means of transport, responsible purchases.
- The EVcom device, similar to the two previous ones, is intended for freight forwarders. Reduction actions over 3 years are structured around 4 axes: clean fleet, transport purchase, customer collaboration and CSR (Corporate Social Responsibility).

As part of this programme, a platform for the exchange of environmental data between transport stakeholders has been set up in order to establish a common tool between these three systems and to facilitate the transmission of environmental information on transport services, such as GHG information (see above).

Policies and measures addressing CO2 emissions_{from} international transport

Air transport

Intra-EU 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 EU scheme for greenhouse gas emission allowance trading. The scheme has applied 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. 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 increased carbon pricing for the sectors covered, including aviation, by accelerating the reduction of the emissions cap, which is expected to maintain a strong price signal for the years to come. The revision also introduced several provisions specifically promoting the decarbonisation of air transport, including: the phasing-out of free allowances for aviation (full auctioning from 2026), the creation of a reserve of free allowances 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 a 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, in the pilot period 2021-2023, have to offset their emissions above the level of emissions in 2019 by purchasing carbon credits, and then from 2024, offset their emissions above 85 % of the level of emissions in 2019. In a first phase, only companies from volunteer countries (including the European Union) will participate. The 2023 revision of the EU ETS also allows for a articulation of CORSIA with the EU ETS, and also provides for a withdrawal that could lead to the extension of the EU ETS to all flights departing from the EU already in 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 for the Overseas Territories) according to a progressive timetable (50 %/70 %/100 % of the 2022/2023/2024 emissions and thereafter) ii) the abolition of flights when a rail alternative of less than 2: 30 is available.

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 from their ships for all intra-Union voyages, all voyages to the Union (between the last port outside the Union and the first port of call located 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 produced in Union ports. These rules apply without discrimination to all ships, irrespective 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 non-EU journeys). In addition, the European co-legislators also adopted in 2023 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 infrastructures for alternative fuels 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. In April 2023, the Commission presented to the government its decarbonisation roadmap, which identifies and analyses the technological levers available for the sector (energy efficiency, energy change, slow speed of ships) and proposes a transition scenario.

Measures to reduce emissions of fluorinated gases (HFCs) from transport

European Directive 2006/40/EC of 17 May 2006 and the measures taken in France to transpose it (Order of 21 December 2007 on the type-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 provides for measures to limit leakage. Since 1 January²⁰¹¹, the air conditioning of all new types of vehicles must be operated with a refrigerant with a GWP of less than 150. Since 1^{January} 2017, that prohibition has affected all new vehicles. In practice, this leads to the replacement of refrigerant gas R-134a (GWP 430) with R-1234yf gas (GWP 4), resulting in very substantial gains.

3.1.5.2. SNBC Guidance

The Clean Mobility Development Strategy (SDMP) sets out the orientations for the transport sector for 2030-2035.

The Clean Mobility Development Strategy (SDMP) sets out the orientations of the transport sector for the EPP (2030 and 2035) in order to meet France's objectives and commitments to combat global warming and reduce energy consumption. It is annexed to the EPP and operationally translates SNBC's objectives 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 major themes, with the aim of achieving operational decarbonisation measures: passenger and freight transport, modal shift towards less carbon-intensive modes, territorial improvements and infrastructure needed to reduce GHG emissions from transport, energy challenges for the transport sector.

In the longer term, SNBC 3 sets out the following guidelines for this sector:

- ✓ Limiting urban sprawl and reducing commuting
- ✓ Reduction of the most emitting journeys
- ✓ Cycling infrastructure deployment
- ✓ Development of rail transport and metropolitan ERNs, public transport and multimodality
- ✓ Greening of labour mobility
- ✓ Implementation of the car-sharing plan

- ✓ Deployment of charging stations
- ✓ Support for the construction and procurement of electric vehicles
- ✓ Electrification of buses and coaches
- ✓ Tightening of maluses for the most emitting and consuming vehicles, eco-driving
- ✓ Deployment of sustainable fuels
- ✓ Reducing the carbon intensity of passenger ships performing a public service mission
- ✓ Adoption of a sector-by-sector approach
- ✓ Managing freight demand and optimising logistical flows
- ✓ Development of rail and inland freight
- ✓ Support for the acquisition of electric vehicles, encouragement of decarbonised modes of transport and empowerment of the most important fleets
- ✓ Speed reduction, eco-driving
- ✓ Deployment and use of sustainable fuels for maritime transport (biofuels, synthetic fuels, etc.)

DRAFT

3.1.6. *Where applicable, national policies, timetables and measures planned to end energy subsidies, in particular for fossil fuels*

There are no fossil subsidies in France in the first sense. The carbon component of energy taxation in place today (see section 3.1.1) increases the cost of fossil fuels according to their carbon content.

However, certain sectors which are heavily subject to international agreements and for which energy accounts for a significant part of their costs benefit from reductions in excise duty rates. This is the case in particular for road freight transport, passenger transport, agriculture and fisheries, and energy-intensive industries which are also subject to the ETS system. Aviation and international maritime transport also benefit from exemptions related to international agreements. The latter two schemes are excluded from the French definition of tax expenditure but are considered as falling, together with all others, within the OECD definition of fossil fuel subsidies.

The identification of these tax expenditures is monitored as part of the preparation of the finance laws. The report on the environmental impact of the State budget, known as the 'green budget', constitutes an environmental assessment of the State budget and is annexed to the Finance Acts.

The following table lists the environmentally unfavourable tax expenditures related to the excise regime and identified in the green budget annexed to the PLF for 2024:

Tax expenditures related to reduced excise duties on fossil fuels	EUR MILLION
road freight transport	1 353
Gases for large consumer installations subject to ETS	872
Gases for energy-intensive installations subject to risk of carbon leakage	117
taxis	67
Fuel used for aircraft and ship test engines	20
Coal for electro-intensive enterprises subject to ETS	14
diesel for extractive activities subject to risk of carbon leakage	9
gas oil used for port handling exposed to international competition	4
Coal for the recovery of biomass subject to ETS quotas	1

In the draft budget law for 2024, the Government proposed phasing out a number of reduced excise duties on fuels. Trajectories to eliminate or reduce the tax gap between the reduced tariff and the normal tariff (EUR 59,40/hL for gas oil, excluding regional variations) are proposed, in particular on:

- non-road diesel (used mainly by the BTP sector, or refrigerated transport). He currently benefits from a tariff of EUR 18,82/hL. The PLF 2024 proposes a trajectory for the complete elimination of the tax niche between 2024 and 2030;
- diesel used by agricultural machinery benefits from a reduced tariff of EUR 3,86/hl. The Government proposes a trajectory to achieve half of the normal tariff by 2030;
- petroleum products (excluding natural gas and coal) consumed by energy-intensive businesses, and coal consumed by energy-intensive businesses exposed to international competition, which will lapse on 1^{January} 2024.

It should be borne in mind that, in the context of the 2023 Finance Law, the Government has already undertaken to reduce certain environmentally harmful tax expenditure in the form of reduced excise duty rates:

- Adoption of a trajectory to increase reduced excise tariffs on coal used by energy-intensive installations, whether or not they are subject to the EU ETS
- A two-year trajectory to align on 1^{January} 2024 the standard jet fuel tariff (EUR 42,131/MWh in 2022) with the tariff applicable to road petrol (EUR 76,826/MWh)
- A two-year trajectory to align the excise tariff for aviation petrol with the tariff applicable to road petrol.

Further reduction of tax niches is desirable, but for sectors subject to international competition, the European and international level seems more appropriate to deal effectively with carbon pricing in certain sectors. Tax convergence in Europe would indeed address this difficulty.

France also supports actions at international level within ICAO and IMO to increase carbon taxation in aviation and maritime.

3.2. Dimension energy efficiency

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 will use the Energy Saving 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 (EEC) scheme, set up 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 final energy cumac) are allocated by the Ministry responsible for energy to eligible actors (obligated parties but also other non-obligated legal persons, such as local authorities, social landlords, etc.) who have carried out energy saving operations meeting certain criteria laid down by decree (standardised operations or specific operations). These EWCs can be freely traded.

Standardised operation sheets, defined by ministerial orders, are drawn up, for the most frequent operations, to facilitate the installation of energy saving measures. They are classified by sector (residential, tertiary, industrial, agricultural, transport, networks) and define the standard energy savings amounts in 'kWhcumac' and the lifetime of operations. These transactions correspond to "expected savings" and are regularly updated. The list of standardised operation sheets is available on the Internet.

These standardised operation fiches are prepared by thematic expert groups, led by the Technical Association for Energy Environment (ATEE) and bringing together stakeholders. The files are then examined by ADEME and validated by the Ministry responsible for energy.

Specific operations make it possible to use energy savings achieved outside 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:

- Make an energy diagnosis;
- Establish the situation prior to the operation;
- Determine the baseline situation and justify its choice;
- Determine the forecast situation after the operation, 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 Energy Saving Certificates (PNEEC) ensure the validity and veracity of the energy savings requested.

The energy savings 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 lump sum logic (average obligation) to a logic of amounts established on the basis of measured energy efficiencies (obligation to achieve results) is under consideration: the introduction of a periodic re-evaluation on the basis of the feedback from the EEC sheets is a first step in this development, which is the main direction for the development of the EWC system for the coming years.

3.2.1.2. Expected cumulative and annual savings and duration of the period (s) covered by the obligation

The first four periods of the Energy Saving Certificates (EECs) scheme were marked by a sharp rise in energy saving obligation levels:

- 1st^{period} (P1): 54 TWhc out of 2006-2009;
- 2th^{period} (P2): 447 TWhc out of 2011-2014;
- 3th^{period} (P3): 850 TWhc out of 2015-2017, including 150 TWhc for households in energy poverty (this new obligation was introduced from 1 January²⁰¹⁶ by the Law for Energy Transition and Green Growth);
- 4th^{period} (P4): 2 133 TWh cumac out of 2017-2021, including 533 TWhc for households in precarious situations.

The scheme is currently in its fifth period (P5): 2022-2025. Decree No 2022-1368 of 27 October 2022 makes P5 compulsory at 3 100 TWhc, including TWhc 1 130 for households in energy poverty.



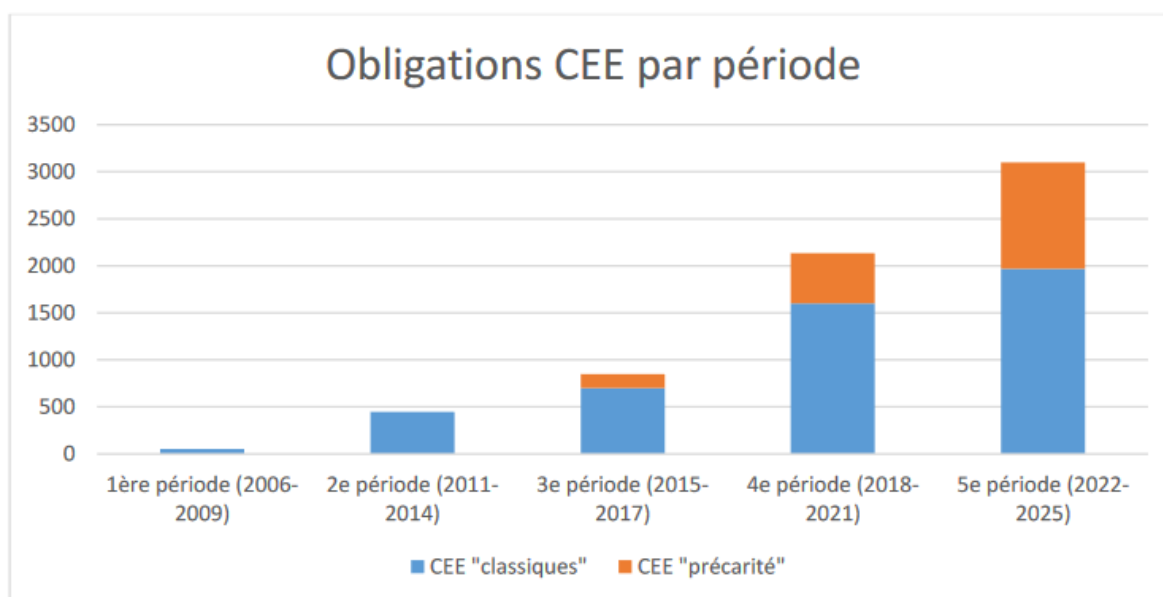


Figure 30: Changes in the level of obligation of the EWC scheme over successive periods⁵⁷

The cumulative amount of energy savings for the period 2021-2030 should be at least equal to the amount 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. The current momentum is positive as energy savings for 2021 amount to 24 TWh, while the level of obligation for 2021 laid down in Directive (EU) 2023/1791 is around 13 TWh.

The two periods covered by the obligations over 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 the public authorities on sellers of energy (electricity, gas, fuel, etc.), known as 'obligated', whose sales of energy exceed 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.

At the end of the obligation period, obligated energy sellers must prove, subject to a dissuasive penalty, that they have fulfilled their obligations by holding certificates of an amount equivalent to those bonds.

⁵⁷ 5th^{EEC} 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>

3.2.1.4. Sectors targeted

The aim of the EWC scheme is to mobilise energy saving sources, particularly in the sectors where they are most diffuse. Thus, the EWC scheme covers all sectors: residential, tertiary, industry, transport and agriculture.

3.2.1.5. Eligible actions foreseen under the measure

In accordance with 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 additionality:

- Only actions going beyond the rules at the beginning of the period may give rise to the issue of EWCs;
- The baseline for the calculation of energy savings packages is the technical and economic state of the market of the product or service at the most recent date for which data are available and taking into account the effect of regulatory developments (in particular EU Ecodesign Regulations for 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 a person engages in actions in a specific operation to achieve energy savings, these can only be taken into account for the issuance of energy savings certificates if the savings outweigh the cost of the investment only beyond a minimum return time (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 envisage the use of alternative public policy measures as allowed 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 encourage 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. These elements will be updated with the renovation plans requested in the revision of the Energy Performance of Buildings Directive (EPBD), the negotiations of which are ongoing.

Compliance with the MEPS (minimum energy performance standards) established for the rental fleet does not give rise to checks and penalties on the part of the State. However, a tenant occupying an indecent dwelling may bring an action before the court and the court may order the execution of works and reduce or suspend payment of the rent until such time as they are carried out. Moreover, undecent housing should not be offered for rental and should therefore not be listed in advertisements.

Finally, France continues to encourage energy renovations carried out by private individuals, with the Ma Prime Rénov' (MPR) schemes or the Energy Economy Certificates (CEE). My Prime Rénov', in particular, favours major renovations of energy passoires.

The improvement of energy efficiency in building renovations is mainly based on the MaPrimRénov' (MPR) aid and the energy saving certificates (CEE) scheme for the private park.

Other main measures are:

- **Construction of nearly zero-energy buildings complying with the environmental regulations (RE2020) of buildings**, in force since 2020. Its aim is to continue improving the energy performance and comfort of buildings, while reducing their carbon impact. Under the Evolution of Housing, Planning and Digital Act (ELAN), RE2020 is structured around three main axes:
 - Improving energy performance and reducing the consumption of new buildings (RE2020 goes beyond the RT2012 requirement, with particular emphasis 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;
 - Live in a living and working place adapted to future climatic conditions with the objective of comfort in summer.
- Transformation of renovated buildings into NZEBs:
 - For tertiary buildings of more than 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 Tertiary).
- Energy efficiency of the residential stock:
 - Significant increase in aid for energy renovation (MPR, EEC) by 2030 and maintained until 2050;
 - Replacing 300 000 oil-fired boilers and 350 000 old gas boilers per year with low carbon heating systems for already well-insulated dwellings;
 - Connection of 300 000 to 360 000 dwellings per year to a district heating network;
 - 400 000 homes and 200 000 multi-dwellings renovated per year on average over the next decade, focusing on energy passoires;
 - For the social park, in addition to the EWCs, specific support measures are provided.
- Energy efficiency of the tertiary park:
 - Gradual reduction of fossil gas in the tertiary park;
 - Reducing the energy consumption of tertiary buildings, in particular through the application of the Eco Energie Tertiary scheme, appropriate support and increased penalties;
 - Example of the public sector.

In view of the recent publication of Directive (EU) 2023/1791, which substantially amends the objectives of the Energy Efficiency 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 for the establishment of an energy performance contract (EPC)⁵⁸.** The clausier contains general administrative provisions (CCAG), special administrative provisions (CCAP), model notices of public calls for competition and consultation rules, and this user guide.
- Introduction of a tool to facilitate access to the system of energy saving certificates for the State.

In addition to the measures listed in the previous paragraphs, the following measures are envisaged:

- Building:
 - Land-based buildings over 1 000 m² owned by public bodies are already subject to the tertiary decree (Decree No 2019-771 of 23 July 2019), which requires the absolute value of the building's energy consumption to be attained or which requires a reduction in their energy consumption by 40 %, 50 % and 60 % in 2030, 2040 and 2050 respectively. This decree, in force since 2019, has already started work on reducing the consumption of their buildings (changing heating methods, etc.) and renovating them.
 - For the application of Directive (EU) 2023/1791, it is planned at this stage to:
 - Provide the State with a platform for the inventory of buildings and the collection of consumption data
 - Examine how the provisions of the EED are to be applied to the various public bodies in order to ensure that the prescribed objectives are met:
 - 1.9 % reduction in public sector energy consumption;
 - On average, the renovation of 3 % of buildings above 250 m² at NZEB level
- Industry:
 - Financial incentives for industry, reinforced by the Emissions Trading System (ETS) and the Energy Saving Certificates (EEC) scheme;
 - Mobilisation of the Heat Fund, which has been cumulative since 2020 with the EWC scheme under certain conditions, as well as calls for decarbonisation projects from France Relance and France 2030.
- **Transportation:**
 - 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 according to EU rules;

⁵⁸ The standard keyboard can be found on the following link: https://lexcity.fr/2022/10/10/publication-du-clausier-cpe-fnccr-fnccr-g_perrin-clausier-cpe-lexcity/

- 51 % of new commercial vehicles sold in 2030, almost 100 % in 2035 (including 23 % hydrogen) according to EU rules;
 - 50 % of new heavy-duty vehicles sold in 2030 electric or hydrogen, 68 % in 2035;
 - Deployment of related charging infrastructure.
- Modal shift for passenger traffic:
 - Increase in public transport traffic by 25 % by 2030 (35 % by 2035);
 - A sharp increase in cycling;
 - Tripling car-sharing by 2027/poursuite of the trajectory to 2030.
- Modal shift for freight traffic:
 - Doubling the modal share of rail freight by 2030;
 - 50 % increase in the modal share of inland freight by 2030.
- Aviation:
 - 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).
- Transport by sea:
 - Managing demand for maritime transport and reducing speed;
 - Improving the energy efficiency of new or retrofit ships.
- **Agriculture:**
 - Increase in the share of non-fossil energy farm machinery to 7 % in 2030 and to 20 % in 2035;
 - Improving the energy efficiency of equipment and buildings (including greenhouses), and deployment of alternative heating systems.
- **Fisheries:**
 - Improving the energy efficiency of new and retrofit fishing vessels.

France also published a sobriety energy plan in October 2022. It was updated in June 2023, in particular to take better account of summer comfort. The 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”, “enterprises”, “establishment receiving the public and tertiary and commercial activities”, “industries”, “housing”, “transport”, “digital”, “sport”, “local and regional authorities”.

The aim is to sustain the declines in consumption observed over a year (-12 % combined gas and electricity consumption) in 2024 and over the long term. The good performance in terms of consumption declines seems to persist in various sectors, as confirmed for example by the ENEDIS analysis published on 19 July on the decline in consumption of street lighting in 2022-23 beyond the winter period.

To move further towards a sobriety in everyone's daily lives, five new announcements were unveiled on Thursday 12 October 2023⁵⁹ by the Minister for Energy Transition Agnès Pannier-Runacher following a dedicated colloquium on:

- continue to mobilise the large French companies by involving the 120 largest companies (those registered in SBF 120),
- enable French people to better steer their energy consumption with a thermostat plan, including greater support for installing programmable devices per piece, which allow 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 in-house mobility, in addition to the support for carpooling, through a donation of EUR 100 to new car-drivers, launched in 2023, which already involved 160 000 drivers,
- offer energy savings and lower bills for energy suppliers.

The arrangements for the operational implementation of the items 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:

- Modalities for the implementation of the energy efficiency first principle for plans, projects and policy decisions;
- Establishment of the list of public bodies;
- Determination of the level of obligation for^{the} 6th period of the energy saving certificate scheme;
- Amendment of the list of companies subject to energy audit or the establishment of an energy management system, and update of the dedicated collection platform.

Several financial measures to speed up the implementation of energy-saving actions will be deployed:

- **Increased aid for the renovation of the housing stock, in particular MaPrimeRénov' (MPR)** to speed up the efficient renovation of residential buildings. A total of EUR 5 billion is foreseen in 2024.
- **Maintaining the 5.5 % VAT reduction** 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)
- **Setting up an industry decarbonisation fund** (EUR 1,2 billion as part of the recovery plan, and EUR 5,6 billion in France 2030)
- **Strengthening the Green Fund**: with a budget of EUR 2 billion, and effective since January 2023 (increased to EUR 2,5 billion in 2024), the Green Fund is a scheme designed to finance projects presented 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.

⁵⁹ https://www.ecologie.gouv.fr/sites/default/files/Plan_Sobriete_energetique_un%20an%20apres.pdf

- **Support from local and regional authorities, in particular through the ERDF Fund:** some local authorities introduce renovation aid, in particular linked to the BBC Rénovation label. This is particularly the case for certain regions, which use part of ERDF funds for this purpose.
- **Green bonus (mobility):** this device supports the acquisition 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)⁶⁰, in particular their mass.

To facilitate the implementation of these schemes, the France Rénov' one-stop-shop will speed up the implementation of work in the residential sector.

3.3. Dimension energy security

Since the previous plan, the war in Ukraine, and the consequent decrease or even halting of Russian gas and oil imports, have put our security of supply under severe strain.

As regards natural gas, the rapid decline in Russian gas exports has created EU-wide supply tensions. A large part of the historically secured supply of Russian pipeline gas imports had to switch to liquefied natural gas (LNG) imports per ship.

This situation has necessitated a short-term strengthening of our import and storage capacities, but in a reasoned manner in order 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 upcoming plan reassesses the relevance of gas storage infrastructure in the light of the evolution of our consumption and the new context of natural gas supply.

On electricity, the plan will focus on exploring and fostering the resilience of our electricity system based on stress tests. It will also pursue the objective of controlling consumption at the forefront and developing the flexibility mix available, in particular: batteries, pumped power transfer stations, demand-side response and interconnections.

The years 2022 and 2023 demonstrated Europe's ability to collectively agree on sanctions and France's ability to free itself from Russian oil and refined products in particular.

3.3.1. Security of fuel supply

Sanctions put in place against Russian petroleum products:

Following Russia's invasion of Ukraine, the European Union has put in place sanctions against Russia. Council Regulation 2022/879 of 3 June 2022 reinforced these sanctions. This 6th package of sanctions, which entered into force on 4 June 2022, lays down a ban on imports by sea of crude oil or petroleum products originating in or exported from Russia.

The regulation provided for a transition period of 6 months 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.

⁶⁰ Presentation of the Green Bonus: <https://www.service-public.fr/particuliers/vosdroits/F36844>
<https://www.service-public.fr/particuliers/vosdroits/F36844>

During those 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 those 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 transitional period, it should be noted that finished products resulting from the refining of Russian crude oil in a country other than Russia can be imported into the European Union, as stated 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 1^{largest} importing country for diesel in Europe and one of the countries most consuming diesel. Dependence on Russian diesel has been growing strongly since 2017. The proportion of refined products from Russia increased from 25 % in 2017 to over 35 % in 2021 and, in some periods of the year, was able to exceed 40 %.

The Atlantic coast is most exposed to an embargo on Russian distillate.

Diesel is supplied to Brittany, Rouen and south-west France by sea. The infrastructure of the oil ports of Bordeaux, Brest, Lorient and Rouen has a maximum reception capacity of 35 kt of oil tankers. 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 resulted in diversification of supplies and adaptation of infrastructure.

Diversification was monitored and encouraged by the government throughout the transitional period in order to anticipate as much as possible and secure supplies by the beginning of 2023. To this end, the Ministry of Energy Transition has put in place a desensitisation plan. Under 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 originating in Russia have taken place since September 2022.

Oil tankers come from more distant countries. Their loading capacity is 100 kt of the supply chain to adapt. These vessels must discharge into the largest French ports with suitable infrastructure (Le Havre, for example). It is then necessary to carry out cabotage operations to supply ports with a maximum vessel 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 at most for a period of five years, will strengthen our natural gas import capacity and be more resilient to a possible technical failure on a gas infrastructure, particularly during periods of high consumption. The projected reduction in gas

consumption as a result of the measures taken in addition will make this terminal unnecessary as of 2028.

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 the reduction or rationalisation of natural gas consumption in order to avoid a widespread or even widespread disruption of supply.

3.3.3. Security of electricity supply

The new French energy programme will include:

- Set the conditions for closure, or conversion with decarbonised fuel, of the remaining coal-fired power plants, to be effective by 2027 at the latest, and of the fuel oil power plants by 2030;
- Remove regulatory brakes to decarbonise existing oil-fired combustion turbines using biofuel (including hydrotreated vegetable oil), with particular attention to converting production tools to overseas;
- Launch studies and/or pilot sites for the conversion and construction of other thermal power plants, where appropriate, to decarbonised energy sources, paying particular attention to biomass availability issues;
- Continue to encourage consumers to choose incentive pricing offers, using the mobile peak formula or other inseparable demand-side response instruments;
- Update the framework for peak and off-peak hours;
- Setting new targets for interconnections in line with projected needs
- Assess the desirability and feasibility of a 'contract for difference' flexibility to remunerate the flexibility provided by producers, particularly from renewable energy sources, and to test them where necessary;
- Support the development of batteries possibly coupled with production facilities through hybrid project-type devices (coupling between means of production and storage) on new or existing facilities;
- Introduce economic incentives or regulatory obligations for the piloting of new equipment, in particular for water heaters, charging stations for electric vehicles and heating or air-conditioning systems (in particular heat pump), relying, where appropriate, on Linky's meter and by standardising the configuration practices of home equipment;
- Anticipating the ability of electrolysis projects to be able to switch off during peak periods without unduly affecting downstream hydrogen consumption;
- Study the desirability of using other technologies that are still underdeveloped, such as inertial systems
- — Develop mechanisms or incentives to exploit the full range of available demand response (explicit, diffuse and industrial demand response, and demand-side response), in order to continue the deployment of modulated tariff offers, particularly at the mobile edge, which have been under way for a year;
- Launch calls for tenders for STEPs to reach an additional minimum of 1.7 GW by 2035;
- Maintain the capacity mechanism after 2026 and study the need for adaptation, in particular on the criterion of security of supply in the light of changes in the electricity mix. Base the mechanism on technology neutrality, where all capacities participate in proportion to their contribution to the security of supply criterion, and make it more efficient and readable for participants.

These initial measures will need to be complemented and deepened, in particular through the TEN analyses requested by the government on the security of electricity supply and flexibility packages, which were presented in its 2035 forecast balance sheet on 20 September 2023, and more precise assessments of mobilisable biomass.

3.4. Dimension internal energy market

3.4.1. *Energy infrastructure*

3.4.1.1. Power grids

Measurements on electricity grids:

- Take account of the network development costs associated with each technology in the allocation of the generation capacity targets to be installed (in particular PV), and better reflect in the connection tariff the costs of each project for the system, taking into account local means of flexibility or storage;
- Continue to implement long-term planning under the supervision of the Energy Regulatory Commission (CRE), through the ten-year Transmission System Development Plan (SDDR) or the network development plans for public distribution system operators whose control by the CRE could be strengthened;
- Provide a framework adapted to anticipate network developments and gradually move from a project-based connection logic to a supply-side approach, in particular in certain dynamic industrial areas for connection, particularly in port areas for connecting vessels with hybrid or electric propulsion, or to accompany the deployment of high power recharging stations or anticipate the development of NERs in certain areas;
- Ensure that investments are sustainable for network operators and control their impact on the Public Network Use Tariff (TURPE);
- Securing and strengthening the industrial value chain associated with electrical equipment and materials by developing 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 grid operating principles 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 final update of the INECP, which will be transmitted in 2024, will also specify the objectives for the development and commissioning of interconnections in line with the projected needs, in particular as regards projects of common interest.

3.4.1.2. Gas networks

The measures:

- Broadening the equalisation between natural gas distribution networks will make it possible to smoothen the impacts associated with reducing methane gas consumption.
- A ban on new concessions for the distribution of natural gas and a framework for the extension of existing networks will limit stranded costs.

- Local planning of the decline in consumption will have to be carried out over the next few years in order to identify areas where natural gas will no longer be used except at prohibitive costs for consumers, particularly in the light of changes in consumption and the potential for substitution by other energy sources.

3.4.1.3. Oil logistics

In order to achieve the objectives mentioned in section 2.4.2., 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 capacity at the level necessary to ensure security of supply (co-processing of crude oil and bio-based oils, Replacement of fossil hydrogen with electrolytic hydrogen, CO2 capture);
- adapting the network to future needs: transport of pure sustainable aviation fuels and CO2 by 2030/2035 in pipelines not used for current fuels;
- adapt 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, in order to anticipate the creation of “white areas”.

3.4.1.4. Hydrogen infrastructure

France has several projects applying for inclusion in the PCI project list for hydrogen.

The French priority for the hydrogen network is its deployment in hubs, and their connection to storage infrastructure, in order to ensure that industry can decarbonise as soon as possible. This represents approximately 500 km of network. These deployments shall be explored together with the decarbonisation solutions of the main industrial areas. After priority development of intra-hub networks and their connection to storage infrastructure, the development of the hydrogen transmission network between hubs will be the second phase of hydrogen network deployment.

Some hubs, particularly close to Dunkirk, will look for cross-border links in the short term.

For the development of hydrogen infrastructure, part of the funding will be available from the CEF (connecting Europe facility) for projects on the PCI list. For these and other projects considered relevant, complementary financing mechanisms of the French State or ways of mobilising private financing. There is no dedicated mechanism for the financing of hydrogen pipelines in France.

3.4.2. Energy market

In order to better protect consumers, the following measures will need to be put in place:

- Complete the reform of the electricity market in order to protect all consumers from market price developments and better reflect in the prices they pay the costs of the electricity system for decarbonisation. In particular, provide for the post-Arenh nuclear regulatory framework or enshrine its fundamental principles and guarantee the cost of financing new competitive

nuclear reactors in order to ensure that all French consumers can continue to have access to the costs of the national nuclear power production tool;

- Incentivising suppliers to a prudent and long-term supply practice, including a minimum share of long-term products to be established with the help of the CRE;
- The arrangements for the development of the energy voucher following the abolition of the housing tax are currently being studied. Improvements to the scheme may also be explored as part of this reform. The next partnership between the Ministry of Energy Transition and the France Services Houses will strengthen information and support to beneficiary households to facilitate the use of the energy voucher and associated rights.

3.4.3. Energy poverty

EPP 3 will include:

- To address the need to accompany the most vulnerable consumers, mobilise the necessary financial resources for the transition;
- Work will be launched in order to be able, in the event of a new price crisis, to deploy new targeted arrangements for exceptional household protection, also linked to the reform of the electricity markets;
- In order to support small households in the energy transition, support for small households may be mobilised (e.g.: energy voucher).

3.5. French innovation research strategy, 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:

- Definition of a solar reindustrialisation pact that will contain commitments:
 - The sector in terms of **local project** management and solidarity between stakeholders, job creation **and number of jobs** created by 2030, social **and** environmental examples;
 - In order to promote social **and environmental exemplarity in public support** schemes (invitation to tender, counters, etc.) and public procurement, together with **targets for the industrial production** of photovoltaic components;
- Creation of an indicator based on the model of the solar panel Made in France and made in Europe, making it possible to highlight those with real French and European added value of the panels and to promote emerging players in the sector.

For offshore wind:

- Continuation of the actions of the Offshore Wind Pact;
- Implementation of calls for projects for industrialisation under France 2030;
- Drawing up a roadmap on adapting ports to the needs of floating wind turbines.

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 serve priority uses;
- Exploit France 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 and export.

3.5.2. French investment strategies in low-carbon technologies

The France 2030 plan consists of several national strategies for Acceleration (SA), which set out the means and measures associated with achieving the various sectoral objectives described in point 2.5.

The SAs enable the State, in collaboration with economic, social and local actors, 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 in exceptional and global terms (financing, standards, taxation, etc.). Each strategy sets out development objectives on key technology bricks, with a view to concentrating research and industry efforts towards the creation and consolidation of sectors contributing to French carbon neutrality. Most of the implementation of a strategy is the launch of calls for projects and calls for expressions of interest within each relevant action. These selective procedures are managed by the French operator 2030 most appropriate among the National Research Agency (ANR), Bpifrance, Caisse des dépôts et Consignations (CDC) or the Environment and Energy Management Agency (Adema).

In line with the ambition to drive genuine sectoral transformations from research to large-scale deployment, the French 2030 Acceleration Strategies accompany industrialisation projects in the same way as those for the design of innovative products. By supporting key stages of development according to the maturity of innovations, SAs promote a better link between upstream and downstream technology deployment. The SA include a Priority Research Programme and Equipment (PEPR) to target technological locks upstream of the establishment of a demonstrator (TRL 1 to 4) on the innovative sector in question.

- **Decarbonised Hydrogen SA** supports the creation of a competitive renewable and low-carbon hydrogen sector in order to make France one of the world's leaders in electrolytically decarbonised hydrogen. This vector offers key solutions for the decarbonisation of industry and heavy mobility sectors.
- The **Innovative Nuclear 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, explores and develops the technical options offered by multi-recycling into pressurised water reactors (MRREP), and supports the innovation efforts of the sector through the deployment of efficient and renovated research tools.
- **SA "Decarbonisation of Industry"** 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 process energy efficiency, decarbonisation of industrial energy mix, deployment of decarbonised processes and carbon capture, storage and recovery.

- **Batteries SA** supports research, innovation and industrialisation of automotive batteries, key materials and components for the manufacture of these batteries, as well as batteries and systems for other relevant markets (aeronautics, space, electric buses, special devices, stationary storage, etc.). It also supports the development of a recycling and repackaging industry and, in conjunction with the SA 'recyclability, recycling and reincorporation of materials', 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 transport sector and to meet the much-needed recruitment and training needs of the sector.
- The '**Advanced Energy Systems Technologies**' 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 revitalise urban development in times of climate change, as part of a process of co-construction with all the stakeholders concerned. The strategy aims to develop innovative and effective design tools and methods, in an integrated sustainable and resilient city approach. Low building technologies and processes, promoting energy efficiency and the use of low-carbon materials, are particularly followed.
- The '**greening of the digital**' SA aims to improve knowledge of the various impacts of digital technologies on the environment, in order to empower France to reduce these impacts, in particular on GHG emissions and energy consumption. This strategy is based on the idea that the development of lower 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 efforts in the mobility sectors, in particular road transport, to reinvent more environmentally friendly modes of transport adapted to the needs of users. Focusing on intermodality and deployment in the territories, the strategy covers the mobility of passengers and goods.
- **SA 'Bio-based products – Sustainable fuels'** aims to promote the development of industrial biotechnology in France and the manufacture of bio-based products, in particular as a substitute for petroleum products. This includes sustainable resource fuels: biofuels (from agricultural, forestry or algae biomass) and synthetic fuels produced from renewable energy.

In addition, the government consulted in June 2023 its main strategic priorities for supporting 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 challenges of innovation for the energy transition: skills, recyclability, reindustrialisation

As France finalises its trajectory towards achieving carbon neutrality, its strategic approach is evolving by encompassing issues indirectly linked to the reduction of the country's GHG emissions.

First, France anticipates the evolution of material supply constraints by supporting the development of product recycling, repair and reuse chains. The idea is to avoid the risk of an energy transition aimed at shifting from one dependence (fossil fuels) to another (materials, which are increasingly scarce and whose production is both energy-intensive and consume water and natural areas).

The SA "Recyclability, Recyclability and Reincorporation of **Recycled Materials**" marks a first step in developing more efficient recycling solutions, including 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.

Large-scale deployment of innovative technologies also requires anticipating the need for adaptation of training and the availability of labour. Skills are key to ensuring a just and effective transition: France 2030 is setting up a first step by unlocking significant resources to develop the training offer for transition professions. The call for expressions of interest 'Skills and professions for the future' (CEI CMA) supports the emergence of talent and the adaptation of training courses 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 significant contribution to the training of talent related to the objectives and levers France 2030, with a high priority for decarbonisation industries.

On the one hand, the CEI for skills and occupations for the future finances diagnoses of skills and training needs by sector at various 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 achieved, France's energy research and innovation policy must actively and effectively mobilise the private sector. France 2030 acts as an accelerator of private sector R & I efforts on the most strategic sectors for the country's economic future. Companies of all sizes (GE, ETI, SMEs, start-ups) are at the heart of France 2030 as stakeholders in the National Acceleration Strategies.

Other schemes complement the French State's support for private sector research and innovation efforts for the energy transition. In particular, France has a system of tax credits that encourages leadership in the field of R & I, and strengthens links between public research and industry. Examples include the Research Tax Credit (CIR), the Innovation Tax Credit (CII), but also the Collaborative Research Tax Credit (CICO) and the Industrial Research Training Agreements (CIFRE), which allow companies to receive financial support to recruit a doctoral candidate in their research work. As early as 2024 (Article 5 of the draft budget law for 2024), these schemes must be supplemented by 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 financing mechanisms at European level, enable major projects to be carried out. The opening up of the first gigafactories (electrolysers, wafers, batteries, etc.) in France is a sign of an advance in the French reindustrialisation project on key technologies, and of the increasing integration of the industrial stages of low-carbon energy value chains.

Digital and energy transition

France sees the challenges of the digital transition and those of the energy transition as intrinsically linked, as digitalisation is a factor in exacerbating climate change, in particular by increasing electricity consumption. However, it could in parallel contribute to the decarbonisation of other sectors.

Most of the French 2030 Acceleration Strategies are based, to varying degrees, on digital solutions to optimise our use of low-carbon energy. In the low-carbon hydrogen, batteries, renewable energy or industry decarbonisation sectors, 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) strategy builds in particular on advanced digital solutions. For example, it identifies energy networks as one of the strategic sectors to steer research and innovation investments: however, electricity grids need to cope with the increasing complexity caused by the massive integration of intermittent renewables and the parallel development of new flexibility solutions. Therefore, the strategy's calls for projects tap into 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 is facing in the context of the energy transition, the Strategy explores digital opportunities 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. The ‘greening of the digital’ SA aims to improve knowledge of the various impacts of digital technologies on the environment, in order to empower France to reduce these impacts, in particular on GHG emissions and energy consumption. This strategy is based on the idea that the development of lower digital products and services represents an opportunity for French and European stakeholders, and requires ambitious R & D; The “SPIN” Priority Research Programme and Equipment (PEPR), led by the CNRS and the CEA, is consistent with the “Digital greening” SA, proposing to explore the possibilities offered by spintronics to implement digital solutions that place energy fruity as an essential performance criterion.

A European and international framework

France's 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 speed up the development and deployment of low-carbon technologies. 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 energy transition. Among the 14 sectoral working groups defined by the SET-Plan, France leads the group on batteries and co-leads the group on nuclear safety. In these working groups, as in all those in which France is a stakeholder, the French national research and innovation programme aligns with those of the other Member States.

France is also participating in the Horizon Europe programme, and in particular in 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 "Climat", "InnoEnergy" and "Raw Materials", which offer international communities of expertise to which the French laboratories commit themselves.

At international level, France participates in the Mission Innovation initiative, alongside 24 other countries. 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 the subject of research, particularly in the field of energy. It participates in the International Energy Agency (IEA) Technology Collaboration Programmes (TCP), 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 Partnership for Hydrogen and Fuel Cells (IPHE) also feed into French research and innovation programmes in strategic sectors of the energy transition. These multilateral bodies make it possible to establish a continuous dialogue between French and international laboratories in order to bring them into line with common objectives.

SECTION B: ANALYTICAL BASIS

4. CURRENT SITUATION AND PROJECTIONS WITH EXISTING POLICIES AND MEASURES

4.1. Projected evolution of key exogenous factors

4.1.1. Macroeconomic forecasts (GDP and population trends)

The following hypotheses were used:

- Population

For the population, the assumptions made are those relating to the central scenario 2021 of the population projections of the INSEE (National Institute for Statistics and Economic Studies).

Population projections in SNBC 3								
in 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>Mainland</i>	64,85	65,14	65,77	66,34	66,73	66,93	66,95	66,84
<i>In addition to sea</i>	2,14	2,15	2,18	2,22	2,25	2,29	2,33	2,37

Table 10: Projected population trends, Source: INSEE, 2021

- Economic growth

The scenario taken is that of the European Commission's framing, adjusted for the difference in population trajectory (the latest population projections made by INSEE lead to population growth lower than that of the EU framework).

GDP growth rate in SNBC 3								
%	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

Table 11: GDP Growth rate

4.1.1.1. Sectoral changes that may have an impact on the energy system and GHG emissions

Such changes are not specifically identified.

4.1.1.2. Global energy trends, international fossil fuel prices, EU ETS carbon price

The price trajectories for imported fossil fuels (in particular oil per barrel and the price of imported gas) and the price trajectory of the ETS are derived from the European Commission's 'Recommended parameters for reporting on GHG projections in 2023' of May 2022.

	Fuel oil 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

Table 12: Prices of imported oil and gas

	EU ETS carbon price							
	2015	2020	2025	2030	2035	2040	2045	2050
EUR 2013/tCO ₂ constant	7,5	15	22,5	33,5	42	50	69	88

Table 13: Price of cabone in the EU ETS

	Assumptions on the evolution of fuel prices (diesel and e10 petrol) in France by 2050							
Current euro (EUR/h L HTT)	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

Table 14: Projected trend in fuel prices

4.1.1.3. Evolution of costs of technology

Cost of electric vehicles

The evolution of the cost of batteries for cars and light commercial vehicles is based on the assumption that the cost of batteries per kWh will fall until 2030 and then stable 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

Table 15: Projected change 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

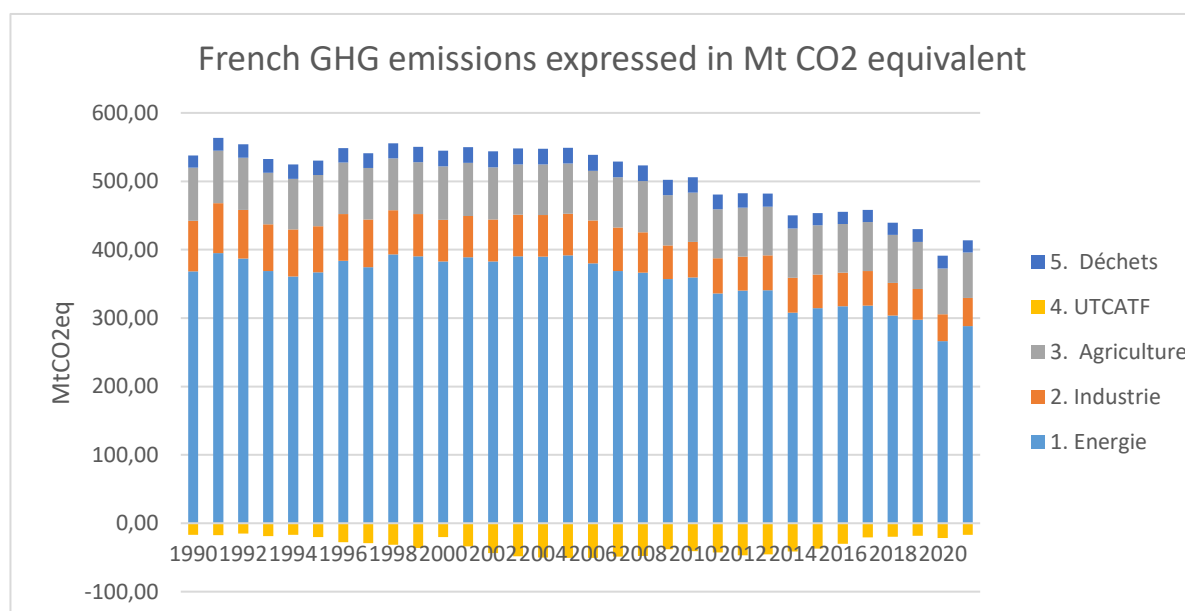
Evolution by sector of activity

The table and graph below show the historical evolution of greenhouse gas emissions and removals in France (scope of the Kyoto Protocol⁶¹) between 1990 and 2021, by major sector of activity and then by sub-detailing the energy sector (FIU categories), based on the 2023 inventory. Emissions from transport and buildings are found in the energy sector.

	1990	1995	2000	2005	2010	2015	2019	2020	2021	Evol ution 2016 /199 0
1. Energy	368,20	366,98	382,63	391,84	359,41	314,45	297,54	266,29	288,07	—
2. Industrial processes and product use	73,83	67,31	61,19	60,92	52,04	49,22	44,90	39,05	41,41	44 %
3. Agriculture	77,71	74,80	78,08	73,35	71,94	72,14	68,83	67,36	66,21	15 %
4. LULUCF	—	—	—	—	—	—	—	—	—	—
5. Waste	17,88	21,24	22,70	23,03	22,41	17,82	18,97	18,72	18,09	1 %
Total (excluding LULUCF)	537,62	530,34	544,59	549,14	505,80	453,64	430,24	391,43	413,79	23 %
Total (with LULUCF)	520,50	510,17	524,47	498,43	465,08	416,63	412,01	369,81	396,73	24 %

Table 16: Greenhouse gas emissions and removals between 1990 and 2021 in MtCO₂e, Kyoto perimeter,
Source: CITEPA/MTES submission 2018, UNFCCC/FIU format – Kyoto scope

Source: CITEPA/MTES submission 2023, UNFCCC/FIU format – Kyoto scope



⁶¹The scope of French emissions under the Kyoto Protocol includes metropolitan France (including Corsica) and the French outermost regions of the European Union: French Guiana, Guadeloupe, Martinique, Réunion, Mayotte and Saint Martin.

Figure 31: French GHG emissions, Source: CITEPA/MTES submission 2023, UNFCCC/FIU format – Kyoto scope

In 2021, France's greenhouse gas emissions (excluding LULUCF) amounted to 413,8 MtCO₂e. They decreased by 23 % compared to 1990. French emissions per capita on the same perimeter increased from 9,3 tCO₂eq to 6,1 tCO₂eq between 1990 and 2021, a reduction of 34 %.

Energy use is the main source of greenhouse gas emissions in France, accounting for 69.6 % of emissions in 2021. For emissions from energy combustion, the most emitting sector is transport (43.1 %), followed by 'other sectors' (according to the FIU classification) comprising energy emissions from residential, tertiary and agriculture (28.1 %).

Details for the different energy sub-sectors (FIU categories) in MtCO₂e:

	1990	1995	2000	2005	2010	2015	2019	2020	2021
Energy industry	66,29	55,76	62,47	66,91	60,09	44,96	41,84	37,58	39,36
Handling and construction industry	65,05	69,25	67,48	65,99	56,29	47,60	44,56	41,72	44,25
Transport	122,26	132,45	140,82	142,07	133,63	133,71	130,86	110,10	124,08
Other sectors (residential, tertiary, agriculture)	102,79	97,74	103,58	110,80	103,43	83,87	76,54	73,72	77,69
Fugitive emissions	11,79	11,78	8,28	6,07	5,98	4,31	3,73	3,17	2,69

Table 17: Emissions from energy sub-sectors

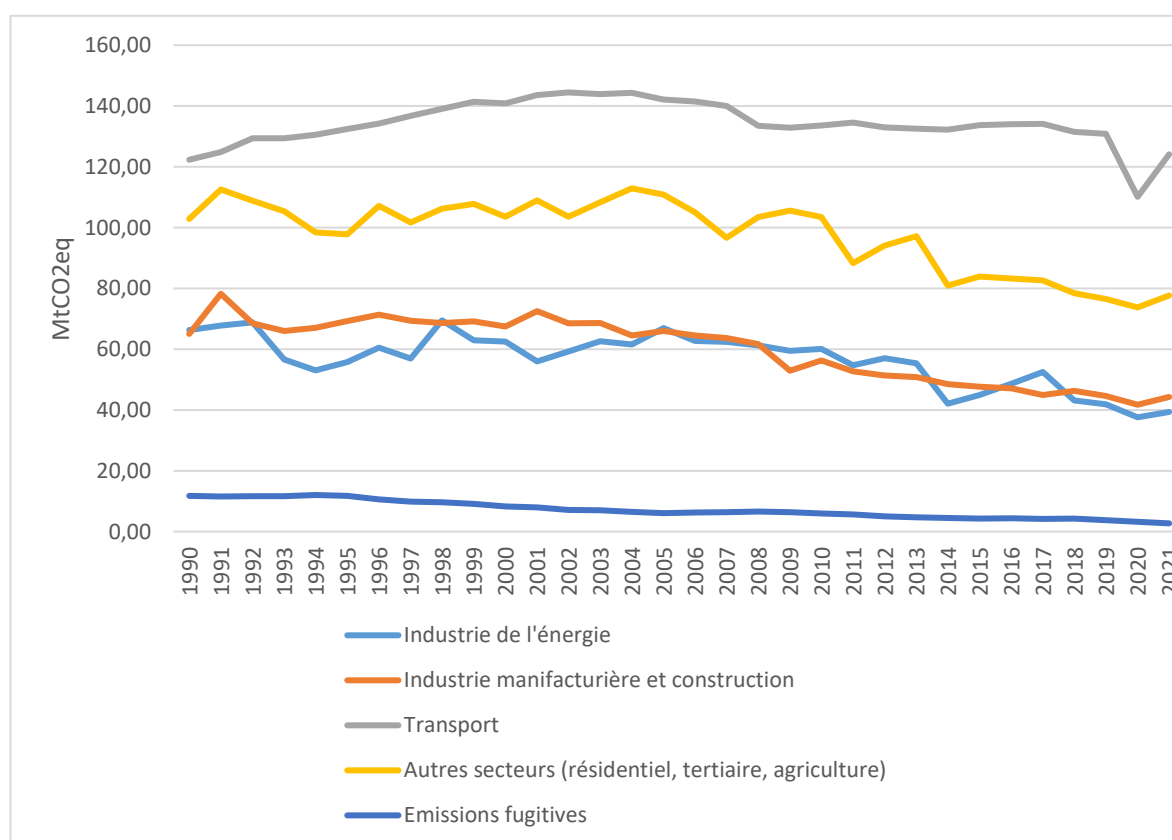


Figure 32: Emission trends in the energy category from 1990 to 2021

Emission trends in the ETS and ESR sectors

The table and graph below show the evolution of greenhouse gas emissions of the HTA 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

* incorporates the scope correction for the years 2005 to 2012

Table 18: Greenhouse gas emissions of the ETS and ESR sectors in MtCO₂e

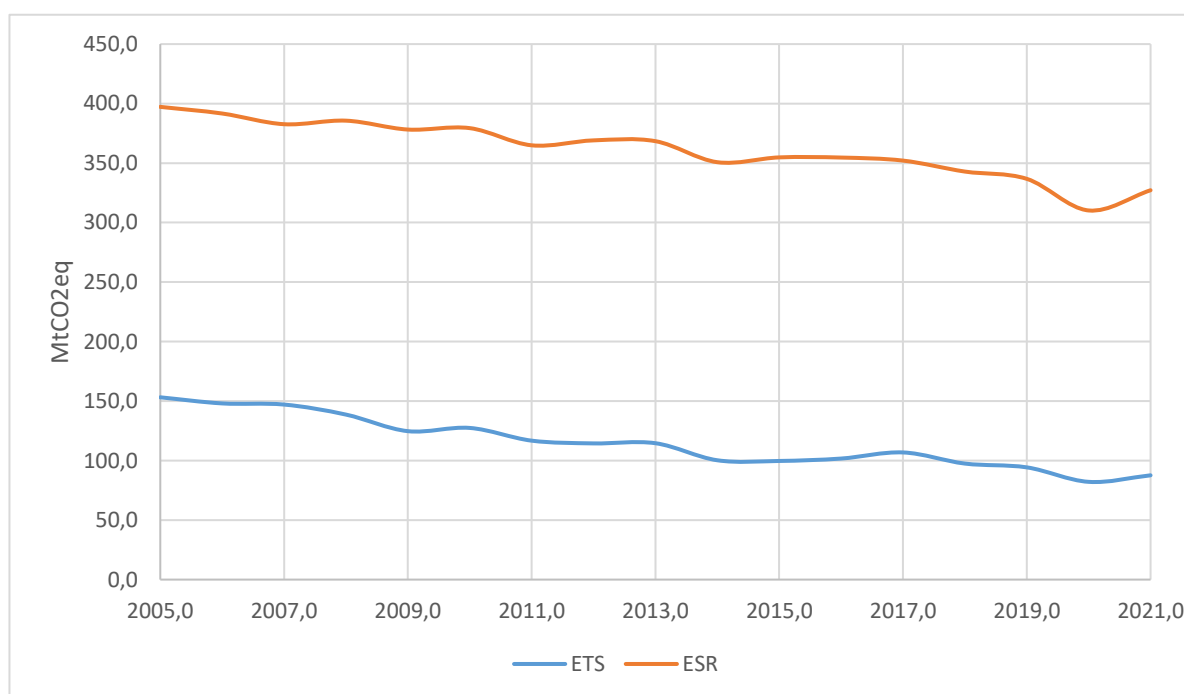


Figure 33: Emissions from ESR and ETS sectors

ESR emissions decreased by 17.6 % between 2005 and 2021. ETS emissions (with a constant scope of the third period) decreased by 42.8 % over the same period.

4.2.1.2. Sectoral emissions projections with existing Union and national policies and measures at least up to 2040 (including for the year 2030)

France conducted a prospective screening exercise between September 2021 and December 2022 with the revision of France's trend trajectory for greenhouse gas emissions up to 2050 ('scenario with existing measures' or AME 2023) as part of the European report (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.

Overall results

The table and graph below show the historical and projected evolution of GHG emissions (Kyoto scope) in the AME scenario. Excluding LULUCF, the emission reduction is:

- 36.824 % between 1990 and 2030
- 50 % between 1990 and 2050.

<i>CO₂e emissions (Mt/year) Scope: Kyoto</i>	2018	2019	2020	2025	2030	2035	2040	2045	2050
National total excluding LULUCF	443,3	434,5	393,0	377,1	343,6	315,1	292,8	276,3	270,8
National total with LULUCF	429,2	422,3	379,0	341,2	302,9	278,2	257,0	244,9	243,9

Table 19: Historical and projected GHG emissions in the AME scenario in ktCO₂e

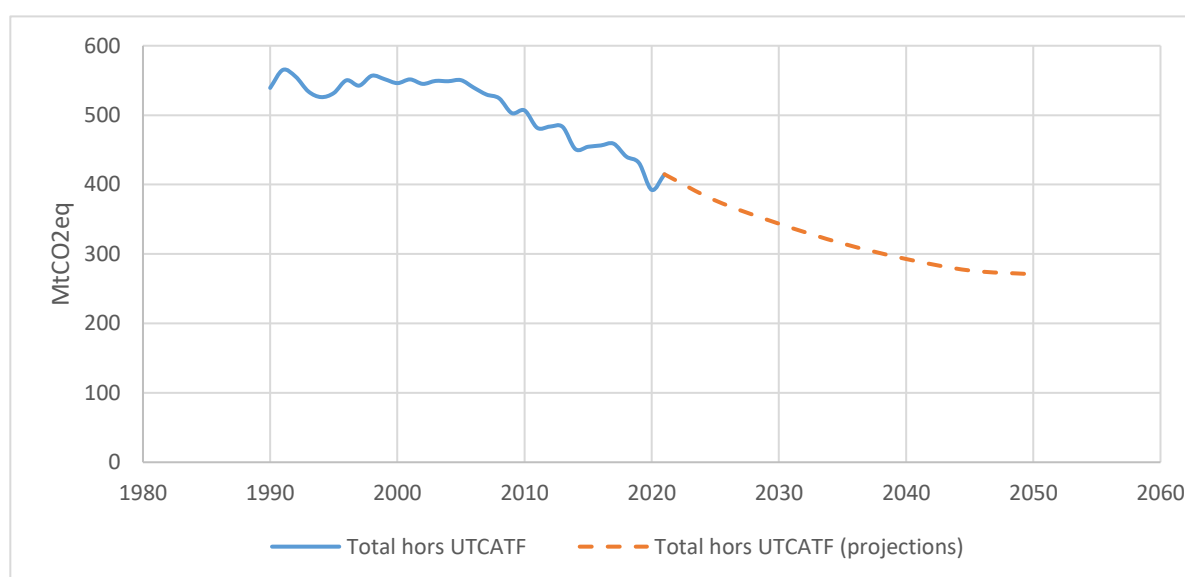


Figure 34: Historical and projected changes in greenhouse gas emissions (excluding LULUCF) – AME scenario, Source: Kyoto scope inventory, CITEPA/MTES, submission 2023 and emission projections AME MTE scenario, 2023

Results by sector of activity

The tables and graphs below show the breakdown of France's emission projections by sector of activity, initially by major industry 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	367 272	357 711	313 634	303 117	297 313	264 730	253 832	226 481	204 826	187 455	175 327	173 651
Industrial processes,	78 729	53 798	50 664	49 059	46 564	40 189	37 569	33 215	29 775	27 640	25 763	23 903
Agriculture	80 803	75 203	75 720	73 549	72 498	70 386	68 908	68 145	66 997	65 852	64 709	63 959
LULUCF	— 23 986	— 38 355	— 34 577	— 14 091	— 12 288	— 14 005	— 23 134	— 22 804	— 19 471	— 18 348	— 17 116	— 15 674
Waste	17 283	20 756	17 905	17 596	18 165	17 658	16 788	15 793	13 539	11 833	10 458	9 329
Total (excluding LULUCF)	544 086	507 468	457 924	443 321	434 540	392 963	377 098	343 634	315 137	292 779	276 258	270 842
Total (with LULUCF)	520 100	469 113	423 346	429 230	422 252	378 957	353 964	320 830	295 666	274 431	259 142	255 168

Table 20: Historical and projected GHG emissions in the AME scenario by major sector of activity (in ktCO₂e)

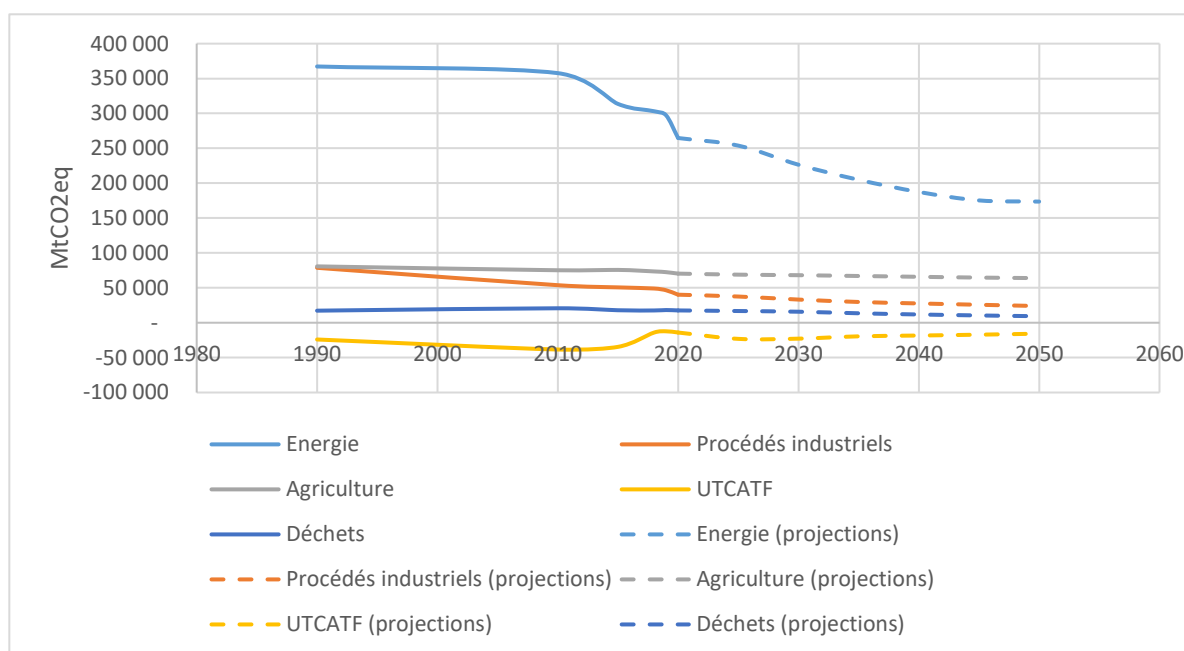


Figure 35: Projections by sector – AME scenario

	1990	2010	2015	2018	2019	2020	2025	2030	2035	2040	2045	2050
Energy industry	66 338	60 134	44 988	43 189	41 680	37 115	27 678	28 088	27 470	26 881	26 560	32 327
Manufacturing and construction	65 165	56 310	47 794	46 517	44 424	42 187	37 388	35 474	33 879	32 423	31 003	29 393

Transport	122 293	133 750	133 744	131 652	131 725	109 469	118 401	102 014	89 350	78 967	73 035	70 871
Other sectors (residential, tertiary, agriculture)	102 477	101 722	82 940	77 663	75 877	72 753	66 003	56 691	50 314	45 916	41 578	37 971
Fugitive emissions	10 999	5 795	4 169	4 096	3 608	3 205	4 361	4 213	3 813	3 267	3 151	3 089

Table 21: Details of the categories of the energy sector (in ktCO₂e)

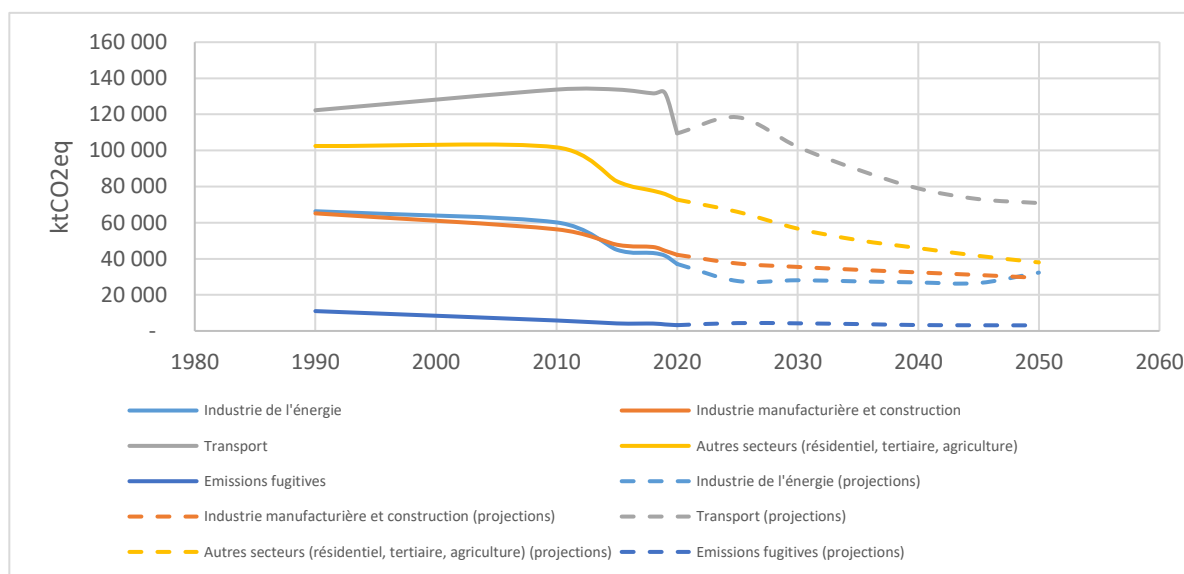


Figure 36: Energy Sector Categories Detailed – AME Scenario

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), 23 % in 2030 and 47 % in 2050 compared to 2015.
- a sharp decrease in emissions from the residential/tertiary sector. Emissions in the category of other energy sectors including residential, tertiary and agriculture (which accounts for a minor part of the category) decreased by 32 % in 2030 and by 54 % in 2050 compared to 2015;
- a reduction in emissions from the manufacturing sector by 26 % in 2030 and by 39 % in 2050 compared to 2015;
- a reduction in emissions from industrial processes, agriculture (excluding energy) and waste treatment sectors by 34 %, 10 % and 12 % respectively between 2015 and 2030 and by 53 %, 15 % and 48 % between 2015 and 2050.

- a reduction of greenhouse gas removals by 34 % in 2030 and 55 % in 2050 compared to 2015 levels.

Results of the AME projections for the ESR sector

The AME projections have been 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 emissions projections, 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, i.e. around 248 MtCO₂e in 2030).

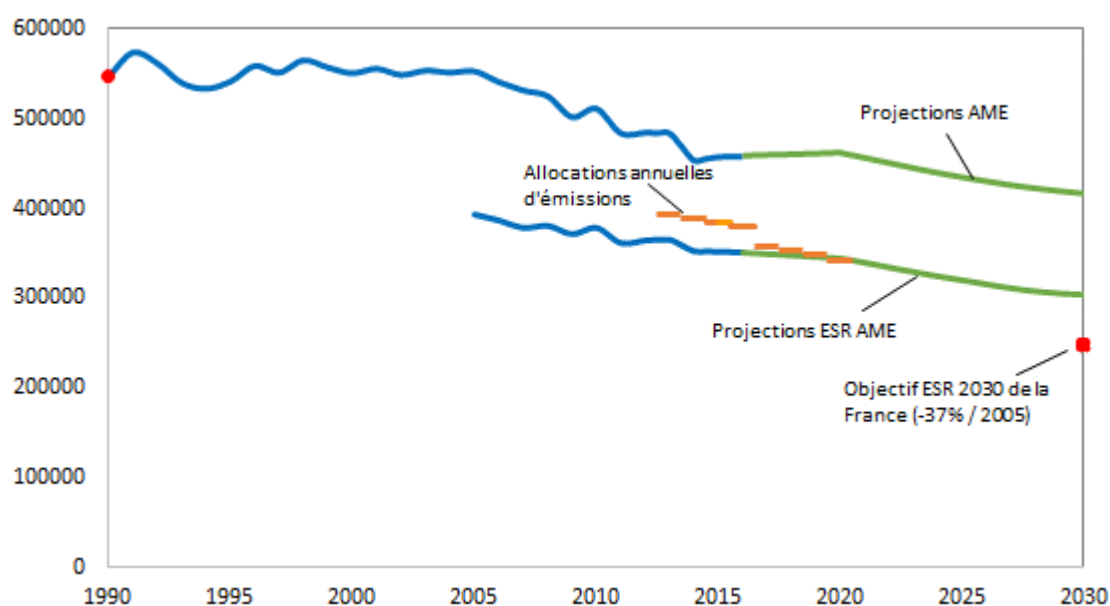


Figure 37: Projections of the AME Scenario for the ESR

In 2020, the projected ESR emissions of the AME scenario amount to 345 449 ktCO₂e, which is very slightly above (+ 0.3 %) of the annual emission allocation of the Effort Sharing Decision for France in 2020 (344 300 ktCO₂e). According to projections, and given the accumulated surplus of annual emission allocations 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 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 embarked on ecological planning, which enables additional concrete trajectories and measures to achieve them.

4.2.2. Low-carbon energy

The share of renewable energy in final energy consumption was increased to 20.7 % in 2022, showing a net acceleration compared to 2021 (+ 1.3 %), and putting France at a level comparable to its main European partners, in particular Germany.

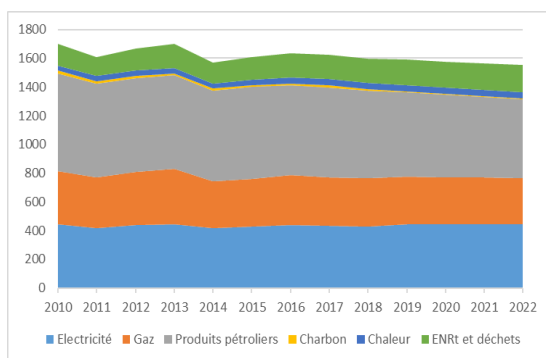


Figure 38: Evolution of the real energy mix (2010-2018) and projected in PPE 2 (2019-2022) by energy carrier

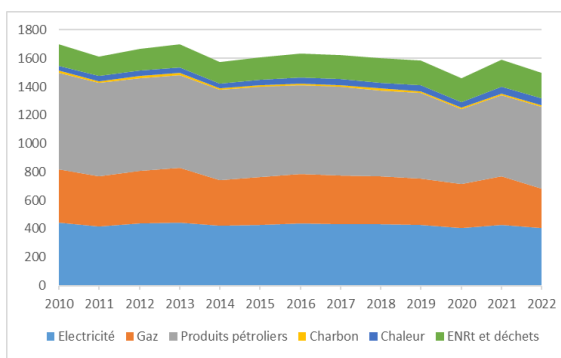


Figure 39: Changes in the energy mix recorded (2010-2022) – Final (2010-2021) and provisional (2022) data – Source: SDES

The French targets are being updated to take into account the developments brought about by the Fit for 55 package and the national energy policy guidelines set out in the multi-annual energy programming law. They will integrate a significant effort to accelerate the deployment of renewable and low-carbon energy to achieve climate objectives and ensure our security of energy supply.

Clear and concrete trajectories are set for the exit of 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 laid down, sector by sector (buildings, industry, transport and agriculture), in order to achieve the targets for reducing our energy consumption which have been reinforced at European level (the target of achieving a reduction of 30 % in 2030 compared to 2012).

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

In 2021:
1590 TWh of energy consumed
(-5 % compared to 2012)

In 2030:
1371 TWh of energy consumed
(-18 % compared to 2012)

In 2035:
1264 TWh of energy consumed
(-24 % compared to 2012)

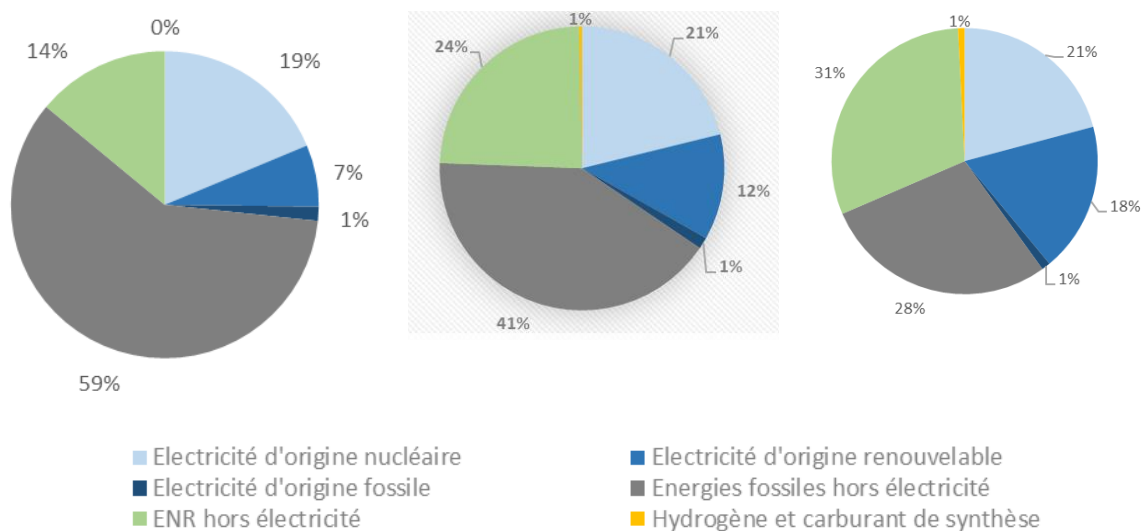


Figure 40: Projected evolution of the energy mix (in final energy consumption for energy use, excluding losses, excluding internal uses for electricity and excluding bunkers; source: *DGEC, provisional modelling*)

4.3. Dimension energy efficiency

In France, the energy consumption data for 2022 are as follows:

- Primary energy consumption (not climate-corrected): 2 482 TWh
- Final energy consumption (not climate-corrected): 1 532 TWh

The sectoral final energy consumption, by sector, for the year 2022 is as follows:

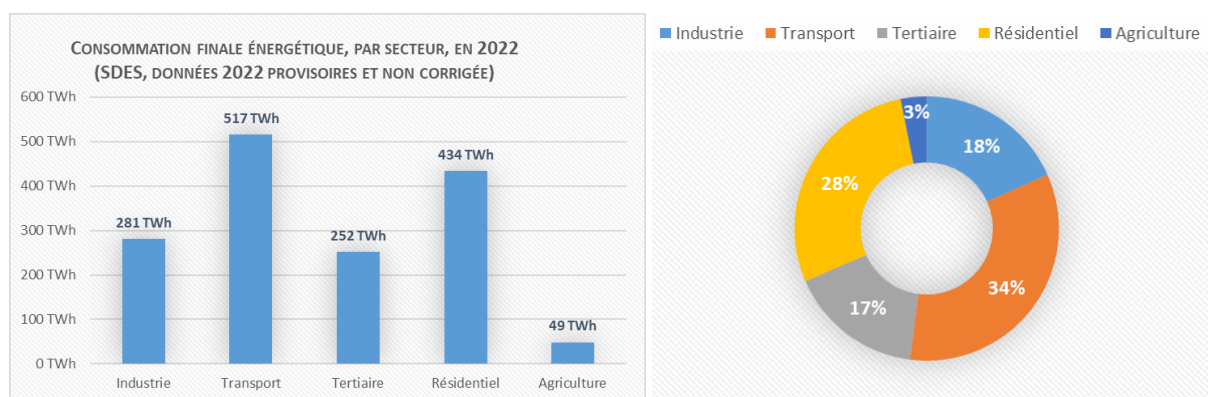


Figure 40: Final energy consumption in France, by sector, for 2022 (SDES, provisional 2022 data, non-climate corrected data)

Maps of the national territory of heating and cooling demand and supply help meet 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 with a map of the national territory indicating:

- heating and cooling demand points in municipalities, conurbations (*anurban group consisting of several urban nuclei whose suburbs eventually join*) and industrial areas with estimated demand in the coming years;
- existing and planned district heating and cooling infrastructure;
- potential heating and cooling supply points with electricity generation installations with a total annual electricity production exceeding 20 GWh, waste incineration plants and cogeneration plants.

The maps are drawn up by the Centre for Risk, Environmental, Mobility and Development Studies and Expertise (CEREMA) on the basis of a preparatory study by the SETEC Environment body.

France has sent the European Commission an analysis of its potential for the use of high-efficiency cogeneration and efficient district heating and cooling. This analysis remains valid and will be updated in accordance with Directive (EU) 2023/1791. It is available on the website of the Ministry of Energy Transition⁶².

The following table details the energy consumption projections for the ‘with existing measures’ scenario (i.e. measures taken on 31 December 2021). The government has since embarked on ecological planning, which allows for more ambitious trajectories and the identification of additional concrete measures to achieve them.

⁶²Website: <https://www.ecologique-solidaire.gouv.fr/besoins-chaleur-et-froid> or at the following link: <https://www.ecologique-solidaire.gouv.fr/besoins-chaleur-et-froid>

	AME 2023
Final energy consumption (TWh)	1432,5
Final energy consumption in industry (TWh)	286,1
Final energy consumption in transport (TWh)	423,2
Final energy consumption in residential (TWh)	451,2
Final energy consumption in the tertiary sector (TWh)	224,8
Final energy consumption in agriculture (TWh)	47,1
Reduction in final energy consumption compared to 2012	15.2 %
Primary fossil consumption (TWh)	999
Primary fossil coal consumption (TWh)	49,2
Primary fossil oil consumption (TWh)	605,8
Primary fossil gas consumption (TWh)	344,0
Reduction in primary fossil consumption compared to 2012	32 %
Reduction in primary fossil coal consumption compared to 2012	66 %
Reduction in primary fossil oil consumption compared to 2012	28 %
Reduction in primary fossil gas consumption compared to 2012	22 %

Table 22. Main energy indicators at 2030

The following graph shows the evolution of the final consumption of the AME on the trajectory.

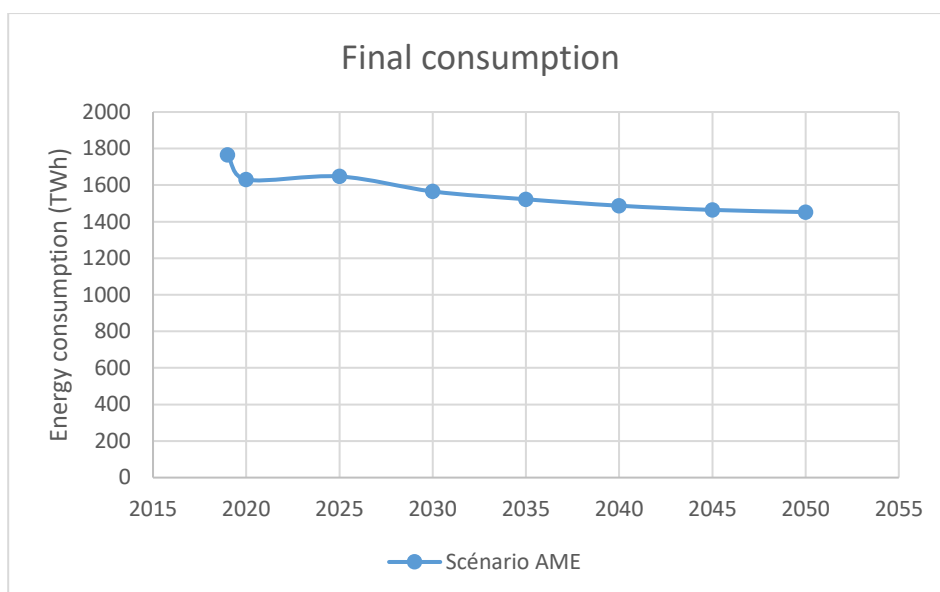


Figure 41: Evolution of final energy consumption in AME 2023, AME 2021 and AMS 2023

Given the date of publication of the Energy Efficiency Directive (EU) 2023/1791, the above data will be completed in the final version of the INECP to be transmitted to the European Commission in June 2024.

In accordance with Article 5 of Directive 2010/31/EU, France has carried out a comparative study between the cost-optimal levels of minimum energy performance requirements and the levels actually set. This study was transmitted to the European Commission in 2018.

The new version of this study is being finalised and will be sent to the Commission in the coming days. This new version also examines the financial optimal requirements of the new environmental regulation RE2020 for new buildings.

4.4. Dimension Energy security

Elements have already been clarified in previous sections on energy security.

This part will be further developed in the final version of the PNIEC.

4.4.1. Security of electricity supply

According to RTE's forecast balance sheet 2023-2035 published in September 2023⁶³ on security of electricity supply.

⁶³ <https://www.rte-france.com/analyses-tendances-et-prospectives/les-bilans-previsionnels#Lesbilansprevisionnels>

- **The risk to security of supply has increased over the last 15 years, in particular as a result of reduced availability of nuclear power plants and the closure of thermal means**

Over the last 15 years, the level of risk to the security of electricity supply has gradually increased in France, although supply has always been ensured. This has been notable since 2020, with a level of risk, 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 TEN in order to mobilise all the levers available to avoid load shedding. The conditions observed in practice (a significant fall in consumption from the end of 2022, relatively mild winter and the smooth functioning of European trade) have finally prevented any cuts due to supply-demand imbalance.

Recent crises (Covid-19, corrosion under pressure) explain in part the sharp deterioration observed over the last three years, but the increase in risk has several structural causes: closure of the oldest and most polluting thermal power plants: it had been anticipated for a long time in the forecast report and was the result of technical (obsolescence of certain installations, the duration of which could not have been extended in any event), economic (lack of profitability and/or need for massive investments) and environmental (reduction of pollutant and particulate matter emissions).

The degradation of nuclear availability: RTE had correctly identified the period 2020-2024 as a pivot, with the completion of numerous post-Fukushima works and the extension of the reactors beyond 40 years, but the actual decrease in their availability went well beyond the worst case scenarios. One part of it is attributable to specific causes, such as corrosion under stress, and another is structural and corresponds to the increase in load of the work of the large carpet. The closure of the Fessenheim power plant, not yet compensated for by the entry into service of Flamanville's EPR, added to this painting but constitutes only a minority part of it.

Among these two factors, the decline in the availability of nuclear reactors is predominant: if the nuclear fleet 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, a number of factors have contributed positively to the security of electricity supply over the last decade, including the development of renewables (despite their variable nature) or the decline in peak consumption. Similarly, interconnection with neighbouring countries has played a positive role. The winter of 2022-2023 thus showed that, despite widespread tension on the energy supply of the European continent, electricity exchanges between countries had worked very well, in accordance with European rules.

- **The situation has stabilised: security of supply will increase in the coming years**

The French electricity system has now passed the most delicate period identified in past studies, which has been aggravated recently by the health crisis and the corrosion of part of the nuclear fleet.

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 the 'zero risk': the electricity system will remain sensitive to cold spells, especially if they are accompanied by weak winds in Europe.

This gradual improvement will be allowed mainly by increasing nuclear availability, although it is not expected to return to its level in the early 2010s: controlling downtime, particularly close to and during winters, is an imperative for security of supply. It will depend to a lesser extent on the development

of renewables, including the commissioning of the first offshore wind farms (which have a significant load factor, notably 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 declined in recent years and in particular since autumn 2022 thanks in particular to the sobriety plan put in place by the government. While long-term consumption dynamics are clearly expected to rise, there is considerable uncertainty as to how this path will materialise in the short term, in a context of economic uncertainty and rising electricity prices.

In this context, the schemes deployed in recent years to raise public and business awareness of the risks and enable collective action to limit the risk of cuts in the event of a degraded situation (Ecowatt) should be maintained. The same applies to the adaptation of tariff signals and the development of consumer flexibility, particularly in the service sector.

Finally, the final shutdown of the last two coal-fired power plants is possible but subject to strict security of supply conditions: the restoration of a high availability of nuclear power stations, and specifically the nominal operation of the Flamanville EPR for the Cordemais plant due to the specific constraints on Brittany's food. The operating times of such plants required for security of supply shall not exceed the ceilings laid down by law and regulation.

4.5. Dimension internal energy market

4.5.1. *Energy infrastructure*

See parts 2.4 and 3.4.

4.5.2. *Energy market*

See parts 2.4 and 3.4.

4.5.3. *Energy poverty*

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 energy R & D expenditure, collected in 2021, show this upward trend (see 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 notable rebound since 2020. In constant decline since the end of the last century, R & D in fossil fuels accounts for only a marginal share of public research expenditure.

Source: 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

En M€₂₀₂₁

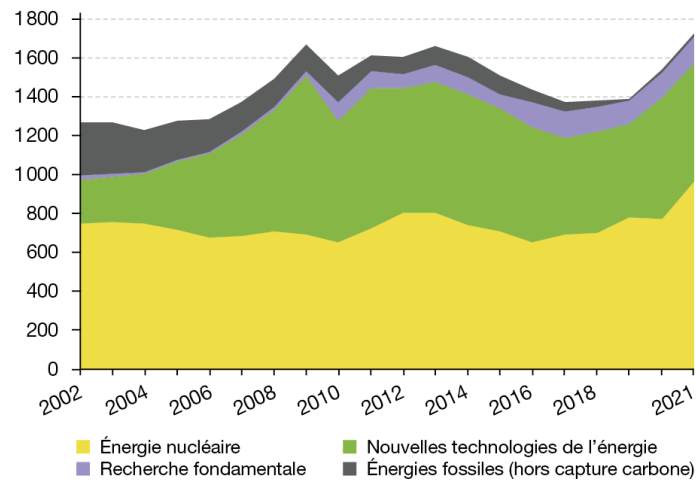


Figure 42: National public expenditure on energy R & D by domain from 2002 to 2021

The figures presented in this graph do not include the public expenditure of the EUR 54 billion France 2030 plan.

The French R & D ecosystem is at the forefront of global excellence in all energy-related topics. French research is present throughout the whole value chain of innovation, 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 for energy transition (ITE), which act as interdisciplinary platforms between public research and industry in the field of decarbonised energy, in order to encourage public-private co-investment and strategic convergence between the various players. The ITE labelled bodies thus target the industrial development of a comprehensive industry, from technological innovation to the demonstrator and industrial prototype. They can be distinguished in particular by the setting up of R &D; industrial R &D; Seven ITE certified campuses of excellence currently bring together academic research, large groups and fabric of SMEs on the topics of energy transition: Efficacity (energy and ecological transition of cities), France Energies Marines (marine renewable energy), IPVF (solar technologies), Ines.2S (PV energy integration), Supergrid (electricity grids), VeDeCoM (sustainable mobility) and Nobatek INEF4 (building).

5. ASSESSMENT OF THE IMPACT OF PLANIFIED 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 of GHG emissions and removals and, where applicable, of air pollutant emissions in accordance with Directive (EU) 2016/2284 as part of the 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 relies on **important foresight modelling. In this context, the** Ministry for Energy Transition (the Directorate-General for Energy and Climate) is building an energy and climate scenario to describe a **target trajectory for reducing greenhouse gas emissions up to the objectives set for 2030 and until carbon neutrality in 2050** ('with additional measures' or AMS). This work is not a forecasting exercise but rather a planning exercise: the aim is for the State to set out, among the various possible trajectories, a scenario based on a set of measures and assumptions.

The **aim of this scenario is to draw up carbon budgets, to determine the roadmap to be followed** by sector in order to achieve France's climate and energy objectives and to **serve as a reference for other planning documents**, whether they are produced by the State, local authorities or even companies.

This screening work is **based on a set of sectoral modelling** involving internal or external tools (CIRED, Solagro, Enerdata, etc.). Sectoral modelling, supported by assumptions made following consultation and dialogue with stakeholders and established taking into account additional support policies and measures, allows for the estimation of certain activity data, such as vehicle traffic, number of energy renovations of dwellings, livestock size or energy consumption. **The results of sectoral modelling are then aggregated**, first in the form of energy balances and then in the form of GHG emission inventories.

The models are used to understand which types of public policy would help to achieve sectoral targets and ensure consistency of results between them ("closing"). One major challenge of this exercise **is to ensure, in the final version of the SNBC reference scenario, the 'closing' of all our trajectories**, i.e. to ensure that all sectors (transport, agriculture, buildings, industry, energy, waste) match needs and resources (quantity of energy, industrial capacity of sectors and availability of skills, financial resources, etc.) at each time horizon, and **to recognise the role each actor will play in providing solutions**.

The baseline scenario takes into account:

- The climate and energy targets set out in EU legislation;
- All EU climate and energy legislation that has an impact on energy prices or creates incentives for decarbonisation. The scenario thus includes assumptions up to 2050 linked to the revision of the greenhouse gas emissions trading system (ETS) as amended by the EU Fit for 55 package and which will apply to emissions from road transport, buildings, small industry and construction (emissions from construction machinery) from 2027 onwards.
- European legislation providing guidance in the development of certain technologies, such as the regulations on CO₂ emission standards for vehicles and the Directive on the energy performance of buildings.
- The international objectives derived from the bodies in which France participates and which commit our country, for example the decarbonisation objectives set by the

International Maritime Organisation (IMO) with regard to international maritime transport.

Developments in the main social dynamics are also taken into account in this screening exercise. This aims both to ensure internal consistency between the different assumptions of the scenario and to better explain the expected changes in the scenario in terms of lifestyles. For example, with regard to health and well-being, the baseline takes into account 'non-climate' policies, which aim to reduce pollution (light, noise, air⁶⁴, etc.), and which encourage people to adopt balanced diets, with more fresh, local, seasonal and quality foods (labels), to engage in more regular physical exercise. Where possible, these developments are reflected in the scenario assumptions (in the case of these examples, on the assumptions relating to street lighting, food and the modal share of bicycles).

This prospective modelling work is **iterative work**, which gradually incorporates the new data available and the effect of the envisaged measures. It is also important to mention that **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 CITEPA (estimated at 6.7 % in 2021) and forward looking trajectories (to levels above 15 %), with uncertainties about changes in emission factors, technological developments and the impact of climate change. **These uncertainties need to be integrated into the decision-making process by taking into account safety margins to develop a scenario that is as robust as possible.**

5.1.1.1. Summary of scenario and AMS projections by sector

Transport

Transport is the largest greenhouse gas (GHG) emitting sector in France: its missions amounted to 126 Mt CO₂ eq in 2021, or about 31 % of national emissions, a relatively stable level since 2009. Its two main sub-sectors are passenger transport, where passenger car GHG emissions are 66 Mt CO₂-eq in 2019 and freight transport, where HGV GHG emissions amount to 30 Mt CO₂ eq in 2019.

Reducing transport emissions requires action on all levers: demand management, modal shift, increased occupancy rate for passenger transport (or freight load ratio) of vehicles, improvement of energy performance of means of transport and electrification of means of transport/use of decarbonised energy such as biofuels.

The modelling exercise carried out by the Ministry of Energy Transition allows at this stage **to reach 90.5 Mt CO₂eq for the transport sector by 2030.**

The main assumptions of the 2030 baseline scenario are compiled below:

Passenger transport:

- **Managing demand for land transport:** stabilising the number of kilometres travelled per year per person for all modes (excluding international transport) (at 15 150 km/year).
- **Modal shift:** increase in public transport traffic (bus, coach, train) by 25 % by 2030. There has been a sharp increase in cycling (from 5 to 19 Mw km).
- **Carpooling:** the average number of persons per car for short distance journeys (journeys of less than 100 km) increased from 1,43 to 1,51 by 2030, corresponding to a tripling of the

⁶⁴ Examples: noise and air pollution policies support the assumptions for converting the vehicle fleet into electric power and light pollution control policies fuel the assumptions of declining street lighting and window lighting.

number of car-sharing journeys by 2027 and a continuation of the trajectory until 2030. In total, all types of journeys, the number of people per car rose from 1,61 in 2020 to 1,7 in 2030.

- **Electrification of light-duty vehicles:** the share of electric cars in new car sales is growing rapidly, reaching 66 % in 2030, bringing the share of electric cars in the fleet to 15 %. As of 2035, in accordance with EU legislation (Regulation (EU) 2023/851), the sale of new thermal and hybrid light vehicles ceased.
- **Electrification of buses and coaches:** the share of electric buses and coaches is growing rapidly: 90 % of new buses in 2030 are electric and 30 % of new buses in 2030 are electric. Hydrogen is also growing, accounting for 2 % of new buses in 2030.
- **Improving the energy efficiency of light-duty vehicles:** the consumption of new thermal passenger cars decreased by 16 % by 2030 compared to 2019, supported by a shift towards lighter, less consumer vehicles and eco-driving, and remains stable until 2035. The share of new electric cars has fallen by 12 % by 2030 compared to 2019.
- **Use of biofuels:** the use of sustainable aviation and maritime fuels, as well as the development of electricity in road transport and short sea shipping (boat connections and waterways), will achieve a target of reducing the carbon intensity of energy used in the transport sector by 14.5 % in 2030, compared to the fossil petrol or diesel benchmark of 94 gCO₂/MJ.
- **Managing demand for air transport:** demand for (total and per capita) air travel increases in the scenario by 2030 (domestic flights and international travel) but at a lower level of growth than in trend scenarios.
- **Improving the energy efficiency of aircraft:** the development of more efficient aircraft as an alternative to the current fleets makes it possible to reduce unit consumption (per passenger and km) by 14 % by 2030 compared to 2019.
- **Use of sustainable aviation fuels:** The use of sustainable alternative fuels in aviation is increasing to 6 % in 2030 and 20 % in 2035, aligned with the EU RefuelEU Regulation.
- **Improving the energy efficiency of ships and increasing use of sustainable marine fuels:** the use of energy efficiency solutions, vessel propulsion assistance and the use of sustainable alternative fuels can reduce emissions from the maritime sector, including passenger ships, by 16 % in 2030. The objectives and regulations of the European Union (in particular the FuelEU Maritime Regulation) and the International Maritime Organisation (IMO) support this strategy.
- **Implementation of the new carbon market (ETS 2)** from 2027 onwards and thus increased incentives to decarbonise transport.

Freight transport:

- **Demand management:** total demand for freight transport increased by 5 % in 2030, lower than in a trend scenario, thanks in particular to industrial transformations (fossil fuel-related industries, electric vehicle industry requiring less parts and therefore freight than thermal vehicle, recycling, reuse, etc.) and buildings (decline in new construction).
- **Optimisation of truck loading ratio:** average loading increased from 8,1 tonnes in 2019 to 8,4 by 2030.
- **Modal shift:** the modal share of rail freight is double by 2030 to 18 %, in line with the national rail freight corridor. The modal share of the river is increasing from the current 2 % to 3 % in 2030.

- **Electrification of vehicles:** the share of electric heavy goods vehicles (HGVs) in new registrations is increasing rapidly to 50 % in 2030, in line with the announcements of the major manufacturers in the context of the revision of the EU Regulation on CO2 emissions 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: for example, 4 TWh of GNV is consumed by heavy goods vehicles in 2030. The share of battery electric light commercial vehicles (LCVs) in new registrations is also growing rapidly, from 5 % in 2022 to 51 % in 2030. In 2035, almost 100 % of new registrations of LCVs are battery vehicles (97-98 %) or hydrogen (2-3 %). For heavy mobility, the use of hydrogen may be an alternative in targeted cases.
- **Energy efficiency:** the consumption of new diesel LCVs decreased by 14 % by 2030 compared to 2019 and new electric LCVs by 20 %. Consumption of new diesel LPs fell by 15 % by 2030 compared to 2019, and new PL electric consumption by 10 %. As regards maritime transport, significant energy efficiency gains are projected as a result of three new EU and IMO regulations that enter into force between 2023 and 2025, resulting in a decrease in ship speed (-15 % by 2030), the use of wind energy for propulsion and the development of lower ships.
- **Sustainable liquid fuels:** sustainable liquid fuels are gradually geared towards modes with the least alternatives, such as heavy construction machinery, agricultural machinery or long-distance heavy goods vehicles. With regard to maritime transport, the use of sustainable liquid and gaseous fuels is becoming more widespread, leading to a 12 % reduction in the carbon intensity of the energy used on-board by ships in 2030 (with a more ambitious target than the EU FuelEU Maritime Regulation 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 maritime transport demand:** maritime traffic increased by 1.5 % per year until 2035 and then stabilised with the objective of repatriating sustainable fuel bunkering in France.

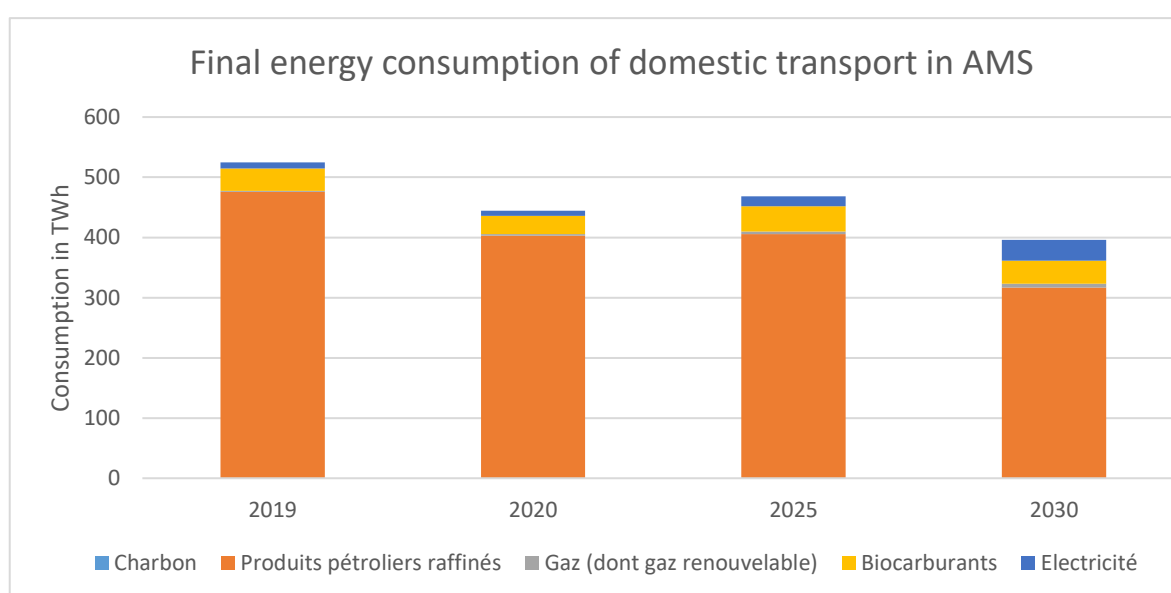


Figure 43: Final energy consumption of domestic transport in AMS

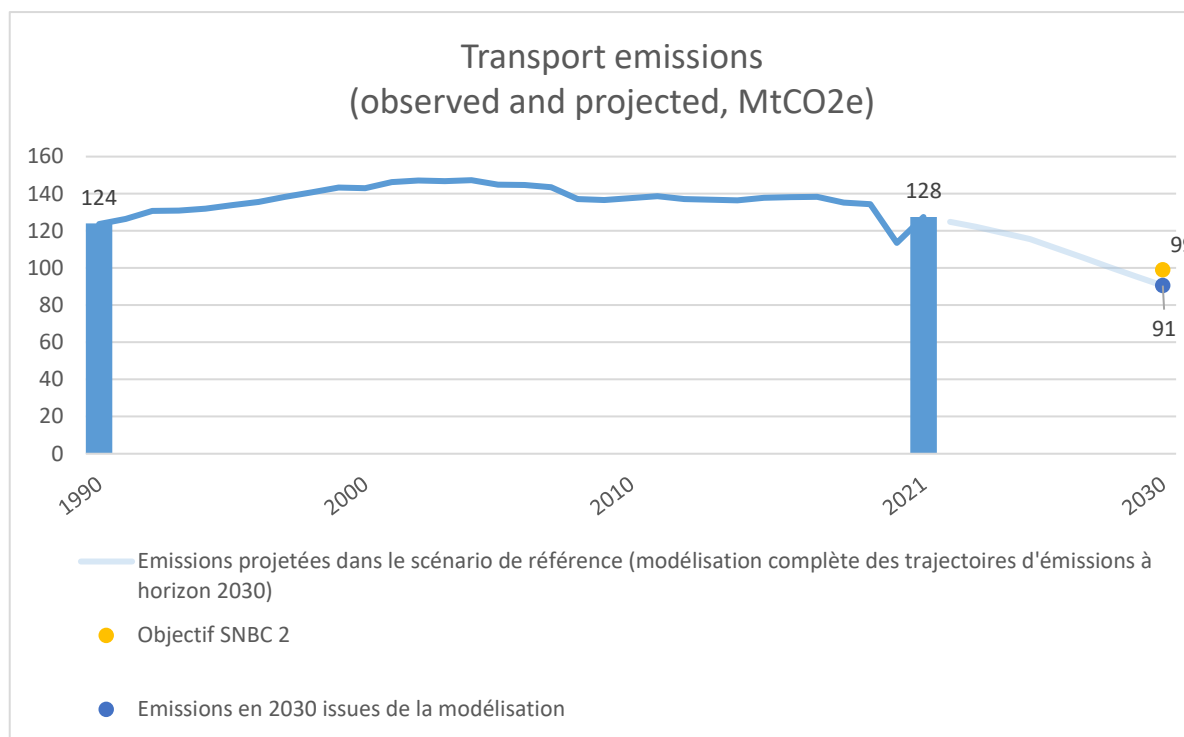


Figure 44: Changes in transport emissions (historical and projected) in Mt CO₂eq between 1990 and 2030 (source: national Greenhouse Gas Emission Inventory, CITEPA, Secten 2023; DGEC modelling)

Buildings

Emissions in the buildings sector are 75 Mt CO₂ eq in 2021, representing 18 % of France's gross emissions. These emissions started to decline since the late 2000s. **The two sub-sectors are residential**, i.e. housing (including the social park), which is responsible for 63 % of the sector's emissions, and **the tertiary** sector, comprising offices, commercial or institutional areas (in particular State and local government buildings), responsible for around 37 % of the tasks. In Secten accounting, only direct emissions are accounted for in this sector, with emissions from electricity production counted as energy.

Reducing emissions in the buildings sector implies a faster reduction in emissions, which implies accelerating the decarbonisation dynamics of heating vectors and a sharp reduction in energy consumption (including through efficient renovations, and sobriety).

The modelling exercise carried out at this stage achieves **35 Mt CO₂eq for the buildings sector by 2030**.

The main assumptions of the 2030 baseline scenario are compiled below:

Residential:

- **Fuel oil outlet:** the baseline scenario foresees the replacement by a decarbonised heating system of 75 % of oil-fired boilers by 2030, or around 300 households per year. Half a million households remain heated in 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 are heated by gas in 2030.
- **Decarbonised heating systems:** the release of fuel oil and gas implies 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 million to 9 million in 2030. In a dense urban environment, the connection to the district heating network of 000 to 360 300 000 dwellings per year makes it possible to reach 3,5 to 4 million homes connected in 2030. To a lesser extent, the installation of biomass boilers to replace heating oil or LPG boilers in rural areas contributes to decarbonisation.
- **Heat heater:** for cooking and domestic hot water uses, decarbonisation dynamics are comparable to heating. Improving energy efficiency also makes it possible to control electricity consumption.
- **Renovation of dwellings:** the number of new innovations is rising sharply by 2030, focusing more strongly on efficient renovations and thermal passives than today. The number of so-called high-performance renovations (if applicable per stage) is around 400 000 individual houses and 200 000 collective dwellings per year on average by 2030 for the private and social park. Some of these renovations are permitted by the decency obligations, some of which came into force before 2030 and the introduction of incentives to renovate thermal passives.

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 in 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 envisages 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 declining sharply, replaced by more efficient air/air heat pumps.
- **Decarbonised heating systems:** the replacement of heating boilers for heating oil, gas and electric convectors involves the massive installation of decarbonised and energy-efficient heating systems. This includes the deployment of heat pumps (around 200 000 thousand m² in 2030), the connection of surfaces to the district heating network (around 200 000 thousand m² in 2030), as well as a more moderate increase in biomass boilers.
- **Excluding heating:** for cooking and domestic hot water uses, decarbonisation dynamics are comparable to heating. Improving energy efficiency also makes it possible to control electricity consumption, despite an increase in data centers consumption due to increased usage.
- **Renovation of the tertiary park:** reductions in consumption and emissions are permitted by improving the energy performance (and sobriety) of tertiary buildings: sites with more than 1 000 mm² of tertiary area are subject to the tertiary eco-energy scheme (40 % reduction in energy consumption in 2030, 50 % in 2040 and 60 % in 2050 compared to a reference year which cannot be before 2010, or failing that an absolute value is reached in kWh/m²/year). The baseline scenario assumes an ambitious implementation of the

scheme with 50 % of areas following -40 % in 2030, with 25 % aiming at absolute values, with 25 % already reaching absolute values. The premises of 500 to 1 000 m² also reduce their consumption in a comparable way to areas subject to the tertiary eco-energy scheme, particularly in the public sector.

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 schemes also lead to sobriety 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 spread of smart control systems for buildings (thermostat type) in all dwellings and tertiary areas. The target temperature is 19 °C in winter and 26 °C in summer for air conditioning use.

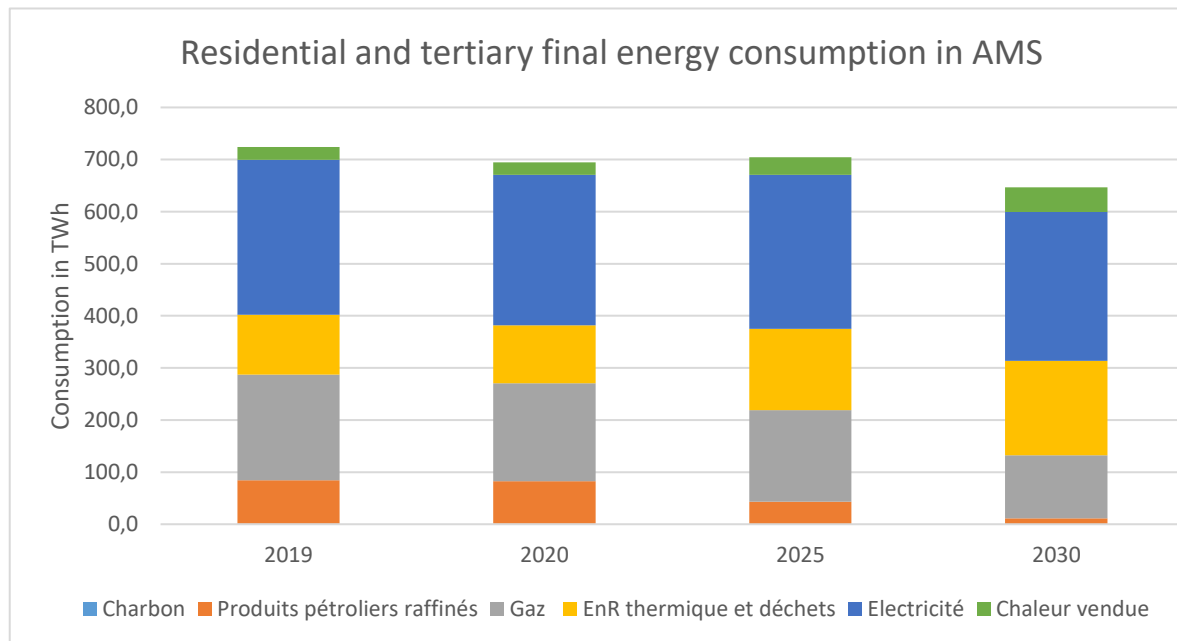


Figure 45: Final energy consumption of buildings in AMS

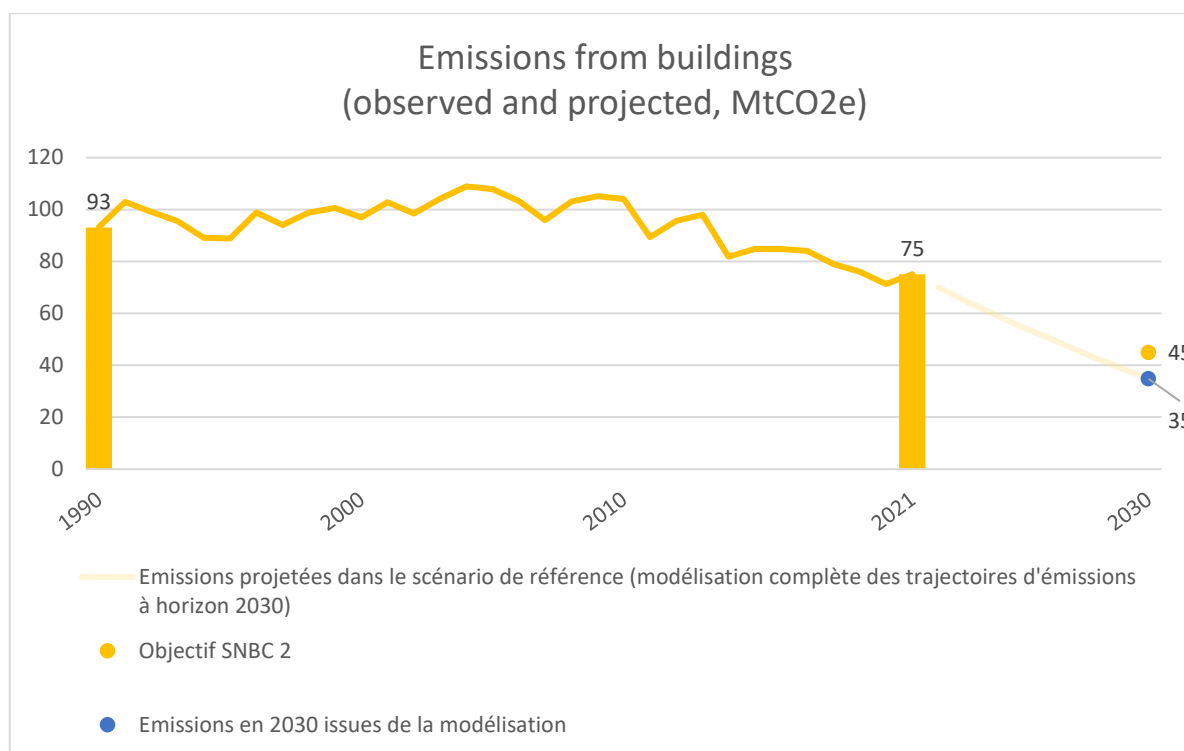


Figure 46: Evolution of emissions in the buildings sector in Mt CO₂e (source: national Greenhouse Gas Emission Inventory, CITEPA, Secten 2023; DGEC modelling)

Agriculture

Agriculture emissions amounted to 77 MtCO₂e in 2021, representing 18 % of France's gross emissions, including **59 % of livestock emissions, 27 % from crops and 13 % from combustion in machinery, engines and boilers in the sectors**. At the same time, the sector can sequester or destore carbon in soils (including permanent grassland) and agroforestry systems.

Emissions from the sector have been slowly declining since the early 2000s, driven by the decline in livestock numbers and a decline in mineral fertiliser consumption. Emissions from agriculture are mostly inherent in the production process itself.

The **agricultural sector faces many challenges in the context of the green transition**: ensure the country's long-term food sovereignty while adapting to climate change and reducing GHG emissions, making agricultural soils a net carbon sink, 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 in **line with a variety of interrelated challenges**. As a result, it aims to **develop less GHG emitting multi-crop farming systems** (developing agro-ecology and precision farming, developing intermediate crops, prolonging rotations, increasing legumes, reducing the consumption of mineral fertilisers, increasing protein autonomy in livestock farming and returning to grass, saving energy, etc.) and

promoting carbon storage in soils, through practices that increase organic matter and reduce greenhouse gas emissions.

In order to build a competitive, sustainable and resilient food system and avoid possible carbon leakage, the **trajectory shall also include guidance on the evolution of diets**, consistent with health, environmental and production system transition objectives.

The modelling exercise carried out allows at this stage to reach **67 Mt CO₂eq for the agriculture sector by 2030**.

The main assumptions of the 2030 baseline scenario are compiled below:

Crops:

- **Changes in production methods:**
 - **Evolution of arable crops towards low-input systems** (50 % in 2030), 21 % of which was in organic farming since 2030.
 - **Extension of rotations and diversification:** 2 million ha of legumes reached in 2030 (doubling compared to 2020).
 - **Development of intermediate crops:** 4,8 Mha reached in 2030.
- **Reduced use of mineral nitrogen fertilisers:** —26 % in 2030.
- **Agro-ecological infrastructure development:** significant increase in intraparcellar agroforestry areas by 2030 (on grassland and arable land) and hedgerows development (see sections 'Bioenergy production' and 'Carbon storage in soils').

Lifting:

- **Livestock trends:** assumption of continuation of trend developments accompanied and planned until 2030 in relation to renewal dynamics, while at the same time supporting the evolution of diets (see Parton Dietary Developments) so as not to increase imports. The trend would be -12 % in 2030 compared to 2020 for bovine animals; —10 % in 2030 for pigs; stable for poultry
- **Herd management:** 25 % of animals in 2030 reduce enteric fermentation by 14 % (optimisation of herd management).
- **Types of livestock holdings:** the share of cattle farms in the dominant grazing system increased from 28 % in 2020 to 45 % in 2030; labelled chickens and organic farming (AB) increased from 32 % in 2020 to 39 % in 2030; the number of pigs labelled and AB increased from 4 % in 2020 to 7 % in 2030.
- **Protein autonomy:** increased protein autonomy of livestock through increased use of cattle grazing and increased production of protein crops and fodder legumes to reduce soya imports by 50 % in 2030
- **Animal manure management and recovery:** widespread use of slurry pit blankets, manure methanisation (see section 'bioenergy production') and improvement of spreading practices (see 'crops' section).

Evolution of food:

- **Diets:**
 - trend towards diets in line with the National Nutrition Health Programme (PNNS) nutritional benchmarks for around 10 % of current adults and 30 % of new

- generations by 2030 (legumes x3, whole cereals x3, fruit and vegetables + 10 %, meat excluding poultry -12 %, etc.).
- changes in dietary behaviour, with the adoption of 'optimal' diets (nutritionally) combined with higher consumption of fresh fruit and vegetables, legumes and whole cereals, and lower consumption of prepared meat and dishes. The flexitarian⁶⁵ and pescetarian schemes thus increased to 9 % and 5 % respectively in 2030, compared with 0 % in 2020. In practical terms, this translates into an average base of 2030 (g/day) in which:
 - plant products accounted for 8 % more in 2030 than in 2020 (from 644 to 696 g/day in 2030).
 - eggs, dairy products, butter and oils increased by 3 % (from 256 to 263 g/d in 2030)
 - meat and poultry fell by 10 % (from 131 to 118 g/d in 2030)
 - and sweet products decreased by 2 % (from 93 to 91 g/d in 2030)
- **Trends in demand:** assumption of sustained consumer demand for local, seasonal and quality products.
- **Combating Food Waste:** food waste fell from 11 % in 2020 to 9 % in 2030.

On-farm energy consumption:

- **Decarbonisation of agricultural machinery:** the share of non-fossil farm machinery (biofuels, HVO₁₀₀, H₂, electricity or e-diesel) 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.).

Bioenergy production:

- **Methanisation:** the share of intermediate energy crops (CIVE) in intermediate crops rose from 4 % today to 19 % in 2030. Methane production reached 15 TWh in 2030 from intermediate energy crops. An increasing share of animal manure is methanised, reaching more than 20 % in 2030. Increasing mobilisation of crop residues, fodder crops, bio-waste and CIVE makes it possible to increase biogas production to an overall level of around 50 TWh of biogas production in 2030.
- **Bioenergy:** the development of agro-ecological infrastructure will be promoted (see section 'Carbon storage in soils and biomass') with the cessation of grubbing-up and the increase of hedgerows and the deployment of intraparcellar agroforestry on grassland and arable land to provide + 3 TWh of wood/energy in 2030
- **Biofuels:** + 2 TWh of liquid biofuels production in 2030 to ensure the development of the second generation.

Carbon storage in soils and biomass:

- **Intermediate cropping cutlery:** intermediate crop cover in winter and summer covers 6 Mha by 2030, three times as much as currently.

⁶⁵ The typical diets in which the population changes are characterised by comparison with the current diet. The flexitarian regime is characterised by zero or very low consumption of beef, pigmeat and processed meat, equivalent consumption in poultry, and increased consumption of plant, dairy and egg products. The pescetarian scheme is characterised by zero consumption of meat (other than seafood) and increased consumption of vegetable, dairy or egg products.

- **Hedgerows development:** while hedgerows are now declining six times faster than they can be rebuilt, the baseline scenario is reversing this trend as quickly as possible, targeting 50 000 linear kilometres of hedgerows planted by 2030.
- **Agroforestry:** significant increase in areas of intraparcellar agroforestry by 2030 (on grassland and arable land).
- **Preservation of permanent grassland:** currently, the area under permanent grassland is 9,6 Mha. This number remains at 9,3 Mha in 2030. The overturning of the meadows is contained.

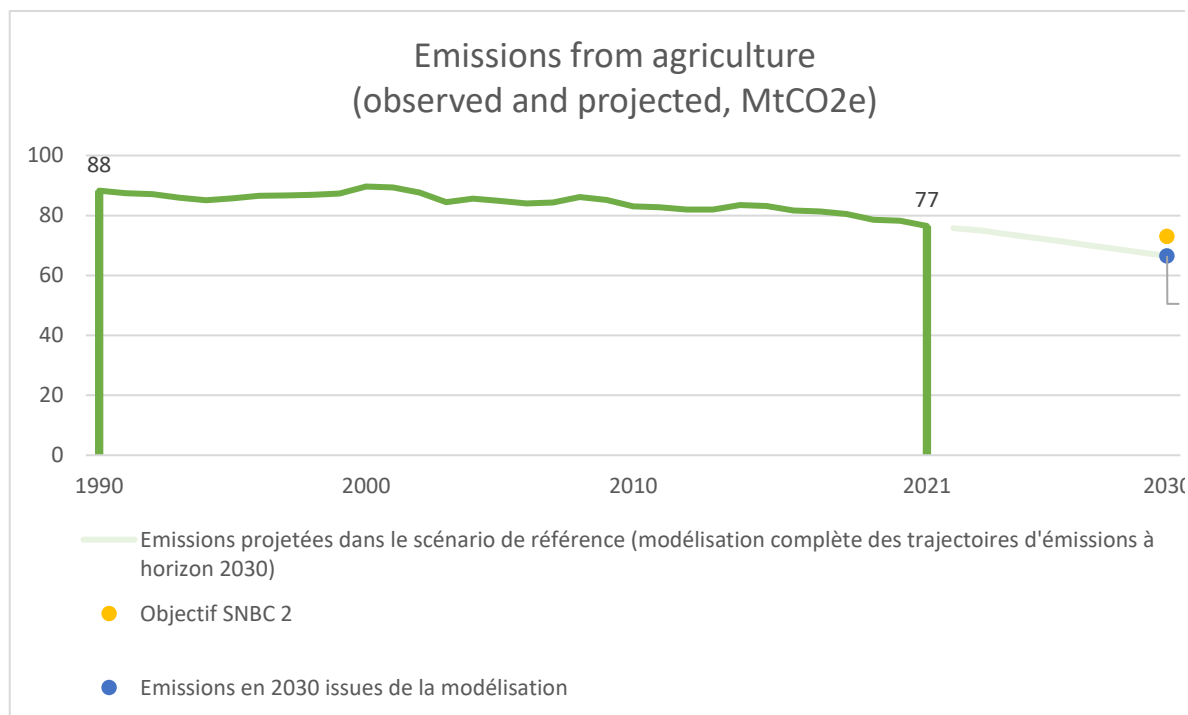


Figure 47: Changes in emissions from the agriculture sector in Mt CO₂eq (source: national Greenhouse Gas Emission Inventory, CITEPA, Secten 2023; DGEC modelling)

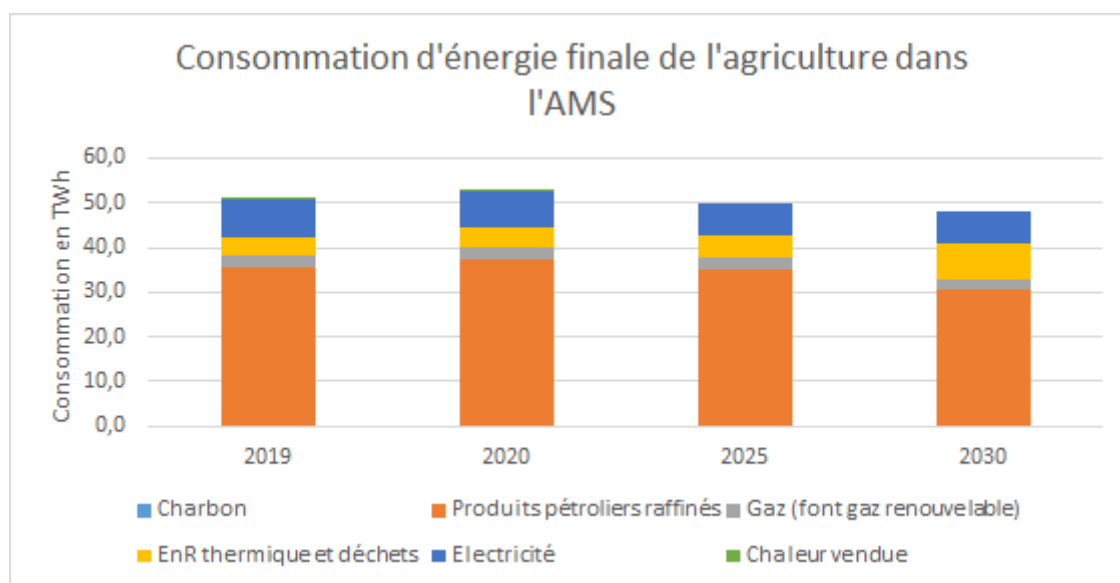


Figure 48: Final energy consumption of agriculture in AMS

Forest/Land sector

The LULUCF sector (Land Use, Change in Land Affection and Forestry) is a sector that allows total_{CO2} removals. In 2021, the sector absorbed 17 Mt CO₂ eq. The carbon sink represented by this sector has fallen sharply within 10 years, largely due to the effects of climate change (drought, heatwave) resulting in increased mortality and less growth in forests affected by climate change (drought, fires, pests).

Overall care should be taken on the figures put forward in the LULUCF sector, whose sink is highly dependent on the forestry sector. The calculation of the main compartments of the forestry sector (increase, mortality, etc.) for a year n corresponds to an average of 5 years from $n-2$ to $n+2$. Taking into account an additional year to carry out the inventories, the final results are therefore only known at $n+3$. However, in order to obtain emissions and removals in “real time”, extrapolations over the last 2 years are made. For example, for 2023, the final results will be known in 2026 and will take into account the averages from 2021 to 2025, however, in order to estimate the emissions for 2023, extrapolations are made for 2022 and 2023. On the other hand, absorption and emission levels of forest compartments are high as they are mainly dependent on growth, mortality and harvesting (the increase is around 130 MtCO₂e). A slight change in one compartment leads to a *de facto* fluctuation of the final well that can be significant from year to year.

As a result of climate change, the French forest is currently experiencing a severe mortality and growth crisis, and researchers and experts find it difficult to decide 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 small in the light of a continuous crisis and which will make it possible to prepare for possible less favourable situations.

The main sub-sectors addressed here are the forest ecosystem, wood products and other LULUCF compartments (deforestation, take, grassland).

Furthermore, with regard to the relevant sub-sectors, the LULUCF sector has a strong link with ecosystems and biodiversity in general. Under certain conditions, the conservation and restoration of natural and semi-natural ecosystems will lead to carbon removal as a co-benefit.

The modelling exercise conducted allows at this stage **to estimate the sink at -18 Mt CO₂eq by 2030.**

The main assumptions of the 2030 baseline scenario are compiled below:

Forest ecosystem:

- **Forest renewal:** planting of one billion trees and forest renewal in the order of 10 % of the forest area put in place in the next 10 years
- **Mortality:** as the evolution of the absorption potential of forests is uncertain, given the strong crisis (notably due to the **succession of drought and heatwave periods and induced scolyte crises**), the mortality rate continues to increase until 2025-2027 and then decreases when it comes to a slight exit from the crisis to around 2030, which is lower than at the peak of the crisis but still relatively above the pre-crisis level (pre-2015).
- **Firefighting:** estimates estimate fires of around 22 000 ha /year in the coming years, taking into account the evolution of extreme weather events and the efforts made to defend (prevention and control) forests against fires⁶⁶, i.e. an atmospheric release of around 0,5 Mt CO₂ per year. In order to monitor fires, SNBC 3 integrates them into forest mortality.
- **Biological increase:** it is estimated that the increase is continuing to decline as a result of the current crisis (succession of periods of drought, heatwaves, scolytes) and subsequently benefited from a partial exit from the crisis in 2030. Guyana Amazon forest is an overall balanced primary forest and its carbon sink is now estimated to be zero. In fact, it is not integrated into the organic increment model⁶⁷.
- **Timber harvesting:** see the Wood Products part.
- **Afforestation outside forest:** 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 therefore does not compete with areas dedicated to agriculture. Afforestation also occurs on industrial brownfield areas, although the latter remain marginal.
- **Deforestation:** see below under "Other LULUCF compartments"
- **Dead wood carbon sinks and in soils:** Carbon sinks of deadwood and in soils are assumed in a scenario called INV +. These sinks and their developments are not yet counted in the national inventories due to the lack of sufficient data but are being worked on to integrate them. The current assumptions on these compartments, in particular the forest soil sink, show a positive evolution of the well in terms of their better coverage within forest routes.

Timber products:

- **Harvesting:** implementation of the National Forest Wood Plan by reaching + 12 Mm³ in 2026 compared to 2016 (+ 1,2 Mm³/an increase over 10 years).
- **Carbon sequestration in wood products:** the share of harvesting processed into 'sawmill' products has risen from 8 % at present to 12 % in 2030. The proportion of harvesting entering the 'panels and insulation' compartment has increased from 12 % at present to 18 % in 2030. Carbon sequestration in wood products has increased from 1 Mt CO₂ eq/year today to 9 Mt CO₂ eq/year in 2030.
- **Development of the circular economy of wood products:** the lifespan of the materials used increases: the half-life of the frames reaches 50 years, 30 years' parquet/lamb, 25-

⁶⁶ By way of comparison, in 2022 59, 000 ha have been burned and an average of 21 000 ha over the last 6 years.

⁶⁷ Primary forests are considered unexploited, so a default neutral assumption is made by considering the forest in balance. As the forest is not used, the trees in which it is composed reach their natural mortality age and destock carbon when decomposed, this destocking will be counterbalanced by organic production, hence the hypothesis of carbon neutrality.

year panels and 7-year paper. The rate of incorporation of recycled raw materials into panels is increasing: 50 % in 2030 as against 40 % in 2021.

Other LULUCF compartments – Artificial/Deboisement-Prairies:

- **Deforestation/deforestation:** two thirds of deforestation today takes place in hexagon and accounts for 10 kha/year. Deforestation emissions increase from 12 Mt CO₂ eq/year today to 7 Mt CO₂ eq/year in 2030.
- **Artificial scrubbing:** the objective 'Zéro Artificialisation Nette' set by the Climate Law and RIndépendance, which aims to halve consumption of natural, agricultural and forestry areas over the decade 2021-2031 compared to the decade 2011-2021, has been met. Commercial land take is divided by 10 and housing by 2 in 10 years.

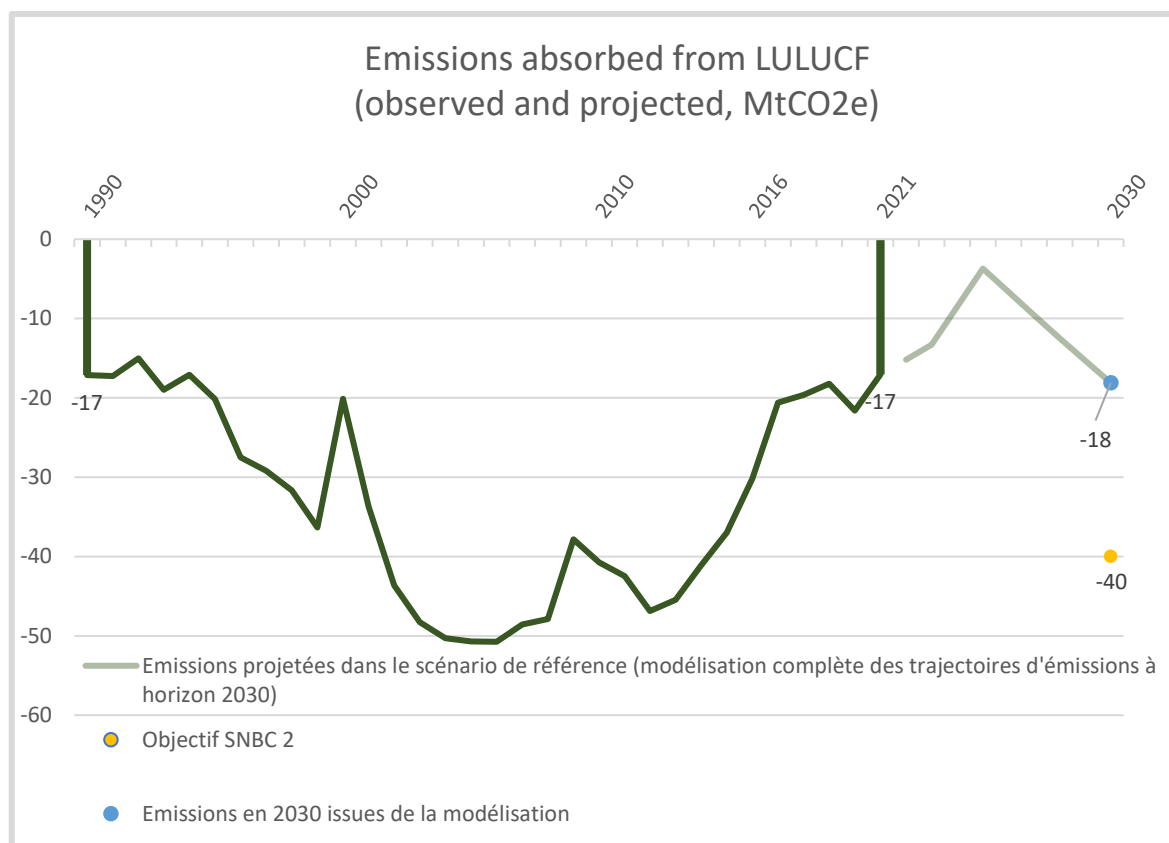


Figure 49: Changes in LULUCF emissions in Mt CO₂eq (source: national Greenhouse Gas Emission Inventory, CITEPA, Secten 2023; DGEC modelling)

Industry

In 2021, industry emissions amounted to 78 Mt CO₂ eq, or about 19 % of national emissions. Three sectors account for 73 % of industry's tasks: metallurgy (18 Mt CO₂ eq), chemistry (20 Mt CO₂ eq) non-metallic minerals and building materials (19 Mt CO₂ eq). In addition, the 50 most emitting industrial sites are responsible for 55 % of the sector's tasks.

Reducing industry emissions requires a profound transformation of industry through the mobilisation of various technological levers, including energy efficiency, substitution of low-carbon (electricity) or renewable energy (biogas or biomass) for fossil fuels, decarbonisation of production processes (use of decarbonised hydrogen, carbon capture and storage, reduction of fluorinated gases or nitrous oxide), modification of inputs in industry (increase in recycling, reduction of clinker rate, etc.) or sobriety (reduction of clinker in cement, less 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 the competitiveness of France of the future, particularly with a view to increasing the carbon price. Indeed, in parallel with the lower emission cap on the EU ETS market, around half of the emissions of European industry will be affected by the phasing-out of free allowances scheduled between 2026 and 2034 and associated with the implementation of the Carbon Border Adjustment Mechanism (CBAM). This scheme, which applies a carbon price on imported products, is intended to limit carbon leakage by subjecting non-EU producers of certain internalistic products to the same level of carbon pricing as European producers. With this in mind, putting our industry at European and global level in its carbon base is a key issue for the most emitting sectors.

Our climate goals require industry to continue its decarbonisation efforts: by 2050, decarbonising industry means keeping only incompressible emissions, and in particular limiting the use of fossil inputs to material use and manufacturing processes for which there are currently no decarbonised alternatives. Industry can also contribute to CO₂_{removals} by capturing and storing its biogenic emissions.

The roadmaps presented to the government in June 2023 by the 50 most emitting sites correspond on average to a cumulative 45 % reduction in greenhouse gas emissions from these sites in 2030 compared to 2015.

The modelling exercise carried out at this stage achieves **45 Mt CO₂eq for the industry sector by 2030**.

The main assumptions of the 2030 baseline scenario are compiled below:

- **Sobriety and green reindustrialisation:** the reindustrialisation in France of imported goods leads to a reduction in the French carbon footprint. It is decarbonised to limit its impact on territorial emissions. Industry adapts to meet society's needs with more sobriety, offering products that use less energy and natural resources, especially fossil fuels. This includes, for example, making more use of alternative building materials, or removing single-use plastics. In particular, reindustrialisation concerns the production of technologies essential for the decarbonisation of industry, but also other sectors such as transport (e.g. battery production).
- **Energy efficiency:** gains in efficiency already achieved in recent years continue. They vary from one industrial sector to another: between 5 and 25 % in 2030 compared to 2021 (with the exception of the ammonia sector 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 power industrial or residential heating networks. Energy efficiency shall reduce emissions by at least 5 Mt CO₂ eq for industry by 2030.
- **Electrification of processes:** industrial processes which may and are not already exposed to reading (e.g.: low-temperature heat in the food industry or chemical industry) involves

readtrification work, in particular through the installation of heat pumps or the mechanical compression of vapours. This electrification enhances efficiency gains in many cases.

- **Energy use of biomass and RSC:** in the industry, biomass resulting in particular from the sustainable management of 'ts' is primarily directed towards high-density uses, which are difficult to read. Solid cooked fuels (RCS), the use of which reduces emissions from the waste sector, are 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 deposit is limited. Priority will be given to the use of biomass in situ, in the circular economy, by the wood industry, always for high temperature uses.
- **Hydrogen:** non-decarbonised hydrogen produced by water electrolysis is used as a substitute for fossil material inputs, and as a last resort as a substitute for energy inputs in the absence of decarbonisation alternatives. In chemistry, it is used as a substitute for hydrogen produced by steam forming 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.
- **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.
- **Reduction of fluorinated gases and nitrous oxide emissions:** the industry continues its efforts to reduce fluorinated gases (including agri-food) and nitrous oxide (including chemistry) by adapting its production processes (e.g. the use of non-fluorinated refrigerants or by using catalysts for N_2O). The reduction of these gases at the high global warming potential makes it possible to avoid 2 Mt of CO_2eq by 2030.
- **Carbon capture and storage:** the objective of carbon capture and storage is to eliminate residual emissions, i.e. those that cannot be reduced otherwise, in particular emissions from incompressible residual processes (e.g.: capture of emissions from limestone carbonation for lime or cement production) with a volume captured in the industry of between 4 and 8,5 Mt CO_2 per year in 2030.

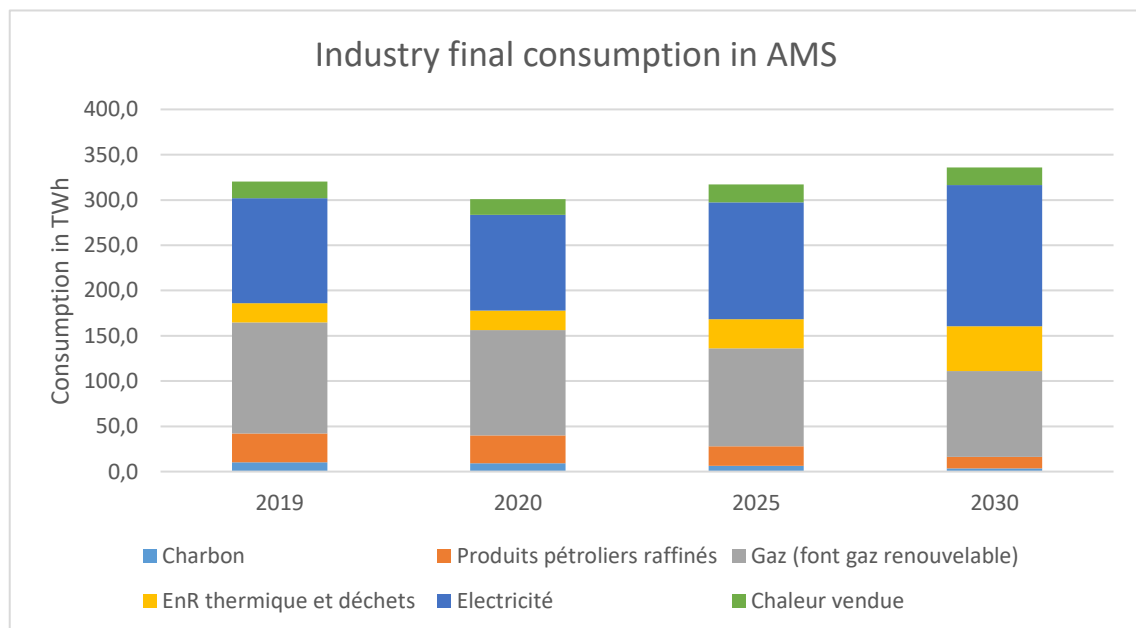


Figure 50: Industry final energy consumption in AMS

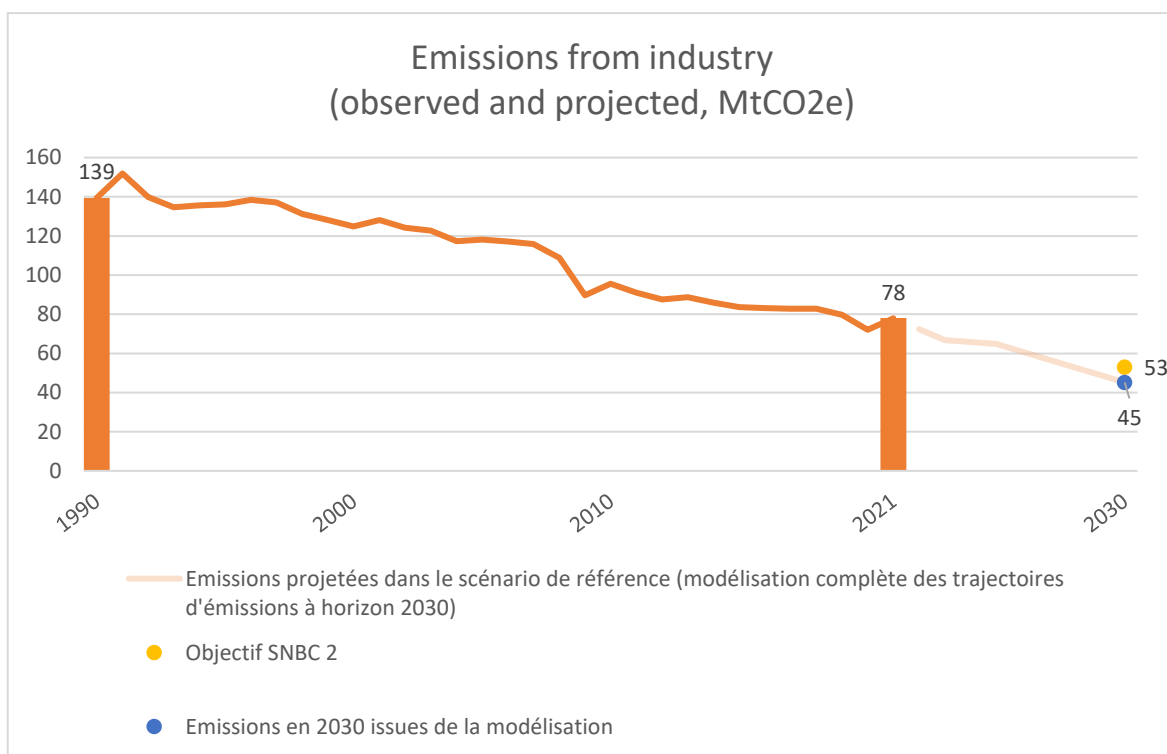


Figure 51: Trends in industrial sector emissions in Mt CO₂eq (source: national Greenhouse Gas Emission Inventory, CITEPA, Secten 2023; DGEC modelling)

Waste

The waste sector emitted 15 Mt CO₂ eq in 2021, or 3,5 % of France's gross tasks. These emissions are mainly related to methane from the degradation of fermentable waste in non-hazardous waste storage facilities (NPISD), as well as methane and nitrous oxide from waste water treatment. To a lesser extent, solid waste treatment (composting and methanisation) and incineration without energy recovery (including hazardous waste) contributes to the sector's emissions. Recycling emissions are counted in industry and emissions from incineration with energy recovery are included in energy (Secten nomenclature).

These emissions are comparable to those in 1990, but have been decreasing since the mid-2000s.

The waste processing and recovery chain also helps to limit France's carbon and material footprint through the recycling of raw materials.

The modelling exercise carried out at this stage **achieves 7 Mt CO₂eq** for the waste sector by 2030.

The main assumptions of the 2030 baseline scenario are compiled below:

- **Prevention:** stable tonnage of non-hazardous non-inert waste around 80 Mt, with a reduction in household waste but an increase in industrial waste linked to reindustrialisation.
- **Redirecting waste to material and energy recovery routes:** the flows of waste in France are overwhelmingly lowered towards the threads of material recovery and energy, in particular 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, composed from 9 to 10 Mt, with the production of recovered solid fuels reaching 4 Mt in 2030.

- **Capture of methane in storage locations:** the rate of capture of BIOM éthane in non-hazardous lime storage facilities (ISDND) increased from 47 % in 2020 to 85 % in 2030. The recovery rate of captured biomethane increased from 77 % to 85 %.

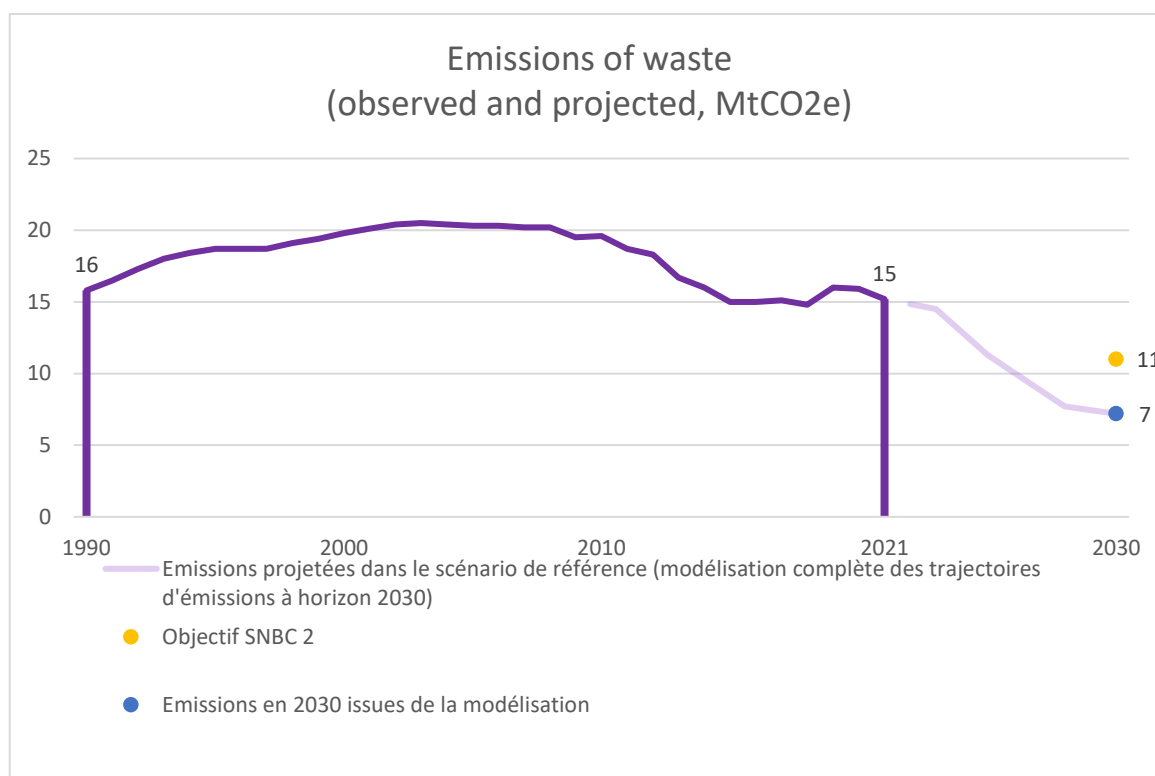


Figure 52: Trends in emissions in the waste sector in Mt CO₂eq (source: national Greenhouse Gas Emission Inventory, CITEPA, Secten 2023; DGEC modelling)

Production of energy

The energy sector emitted 44 Mt CO₂ eq in 2021, representing 10 % of France's gross emissions. These emissions have been decreasing since the 1990s. Energy emissions are divided into electricity generation (45 %), district heating (14 %), oil refining (15 %), waste energy recovery (17 %) and other transformations and losses (9 %). 77 % of the sector's emissions are covered by the European carbon market (EU ETS).

Note: in all sectors, *energy use* is the main source of greenhouse gas emissions in France.

Decarbonisation of the sector must look at both electricity and heat generation, but also refining, CO₂ absorption technologies and responding to growing demand for decarbonised energy. In addition, fugitive emissions of combuse (methane leaks) are intended to be reduced. Specific guidelines and trajectories will have to be decided for non-interconnected areas.

The modelling exercise carried out at this stage achieves **27 Mt CO₂eq for the energy sector by 2030.**

The main assumptions of the 2030 baseline scenario are compiled below:

Production of Electricity:

- **Deployment of decarbonised energy: 96 % decarbonised electricity mix in 2030 (61 % nuclear, 35 % ENR)**
 - Deployment of electric renewable energy: by 2035, the production of almost 140 TWh of additional electricity from renewable energy sources per year, thanks to the proactive deployment of all sectors (photovoltaic, wind and hydropower) to reach around 120 GW installed in 2030, which includes:
 - For photovoltaic: double the annual rate of development of new capacities;
 - For onshore wind: maintain at *least* the current pace;
 - The offshore wind capacity installed in 2030 may not exceed 3.6 GW given the lead times. **The challenge** will 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);
 - 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 reactor power increase;
 - Construction and commissioning of new nuclear reactors: commitment to the construction of three pairs of new EPR 2 reactors at the Penly, Gravelines and Bugey sites and further study of a reinforcement of the nuclear power programme of at least 13 GWe, corresponding to at least the capacity of 8 EPR2 in their current design, in order to enable informed decision-making by 2026;
 - At the latest in 2030, the construction of at least one small modular nuclear reactor power plant of Nuward technology and a prototype of an advanced reactor with commissioning by 2030;
 - Validation of the permanent semi-closure direction of the fuel cycle and, with this in mind, continuing work by the end of 2026 at the latest for decision making, in particular 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:**
 - Closure, or conversion with decarbonised fuel, of the last coal-fired power plants, to be effective by 2027 at the latest, and oil fired power plants by 2030;
 - Decarbonisation of existing oil-fired combustion turbines using biofuel (including hydrotreated vegetable oil), with particular attention to the conversion of production tools to overseas;

- **Non-interconnected areas:** Achievement of 2030 in a more than 99% carbon light mix, allowing a good level of service of electricity, in non-interconnected areas through the development of electric EnR coupled with storage solutions (STEP, battery) and bio-liquid thermal power plants (partly imported from hexagone). Conversion of thermal power plants to decarbonised energy sources, with particular attention to biomass availability issues.

Centralised heat production:

- **Development of R & R;** increase in the share of renewable energy and recovery in the mix of heat networks from 60 % in 2020 to 75 % in 2030 through biomass and thermal energy deployment. The supply of heat sold reached around 68 TWh in 2030.
- **Heating networks:** the rapid development of heating networks is achieved thanks to the support of the Heat Fund, which increased to EUR 820 million in 2024, in particular to support this development.
- **Bioenergy with carbon capture and storage or utilisation:** the production of heat from biomass with capture of CO₂ released makes it possible to absorb 1 MtCO₂/an in 2040.

Hydrogen refining and production:

- **Reduction 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 2030, 15 million tonnes of diesel and 9,5 million tonnes of superfuel will still be consumed.
- **Decarbonisation of refinery sites:** refinery sites are decarbonised through optimisation to improve their energy efficiency and electrification as a first step, alongside the use of low-carbon hydrogen and carbon capture and storage technologies, which will be deployed in the medium term. As regards the limitation of scope 3 emissions, these can be achieved as a result of the production of increasingly decarbonised energy products (biofuels, e-fuels, sustainable aviation fuels, etc.), on existing refineries, if necessary closed and reconverted (fully or partially), or at other sites.
- **Hydrogen production from electrolysis for** all new production capacity and with the objective of achieving 100 % electrolytic capacity in the long term.

DR

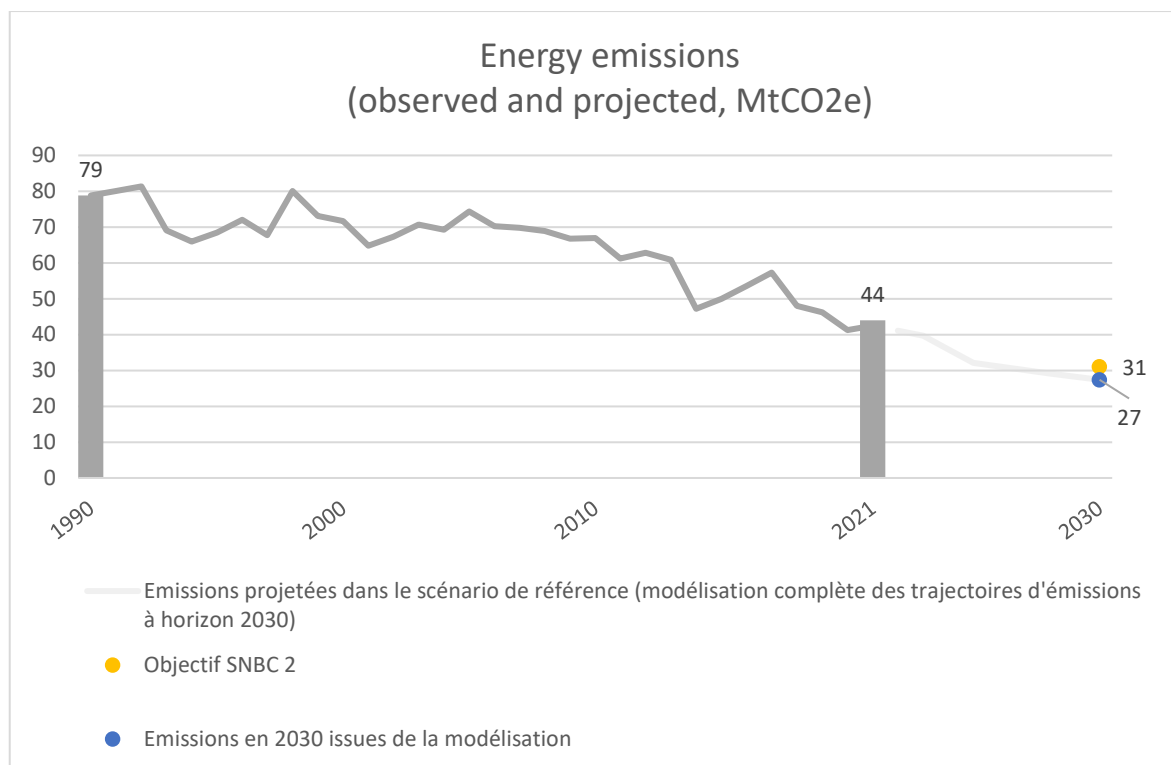


Figure 53: Evolution of emissions in the energy sector in Mt CO₂eq (source: national Greenhouse Gas Emission Inventory, CITEPA, Secten 2023; DGEC modelling)

Some challenges around the scenario

Energy: a challenge of reducing our consumption and producing enough to meet new needs

Electricity needs will increase in the short and medium term mainly by:

- electrification efforts in transport, buildings and industry to meet European and French climate ambitions;
- reindustrialisation that will bring new energy needs;
- the potentially limited availability of other decarbonised energy carriers, including biomass.

Many levers will be mobilised to increase electricity production: acceleration of the deployment of renewable energies, continued operation of existing nuclear reactors, construction of new players. However, some of them will only be operational in several years (new reactors, offshore wind). As regards interconnectors, if they undeniably contribute to our security of supply, a cautious assumption at European level could be to consider their contribution in the coming years to be stable.

Ensuring the security of the French electricity supply also means managing electricity consumption, both of which are sobriety and energy efficiency.

Energy efficiency will thus have to be optimised (bringing primary energy consumption closer to final energy consumption) and sobriety behaviour (reducing energy consumption) adopted in order to meet the targets. However, these levers will not be sufficient to meet the electricity needs,

which are driven up by the factors outlined above. It is therefore imperative in the French energy strategy to encourage as much as possible all curators of decarbonised energy production.

The challenges of closing electricity will relate both to the amount of electrical energy available (power loop) but also to the ability of the electricity system to meet demand at all times, including at the spike, when consumption is greatest (power loop). In addition to the need to reduce our energy consumption, there is therefore a need to better steer our electricity consumption by developing contractually controlled steering and demand-side response technologies.

As it stands, with the proposed measures in the draft baseline scenario, **the balance of electricity production and consumption (loop) is ensured by 2035.**

The challenges associated with electricity generation are set out in the draft Third Multiannual Energy Programming, which will be published shortly for consultation.

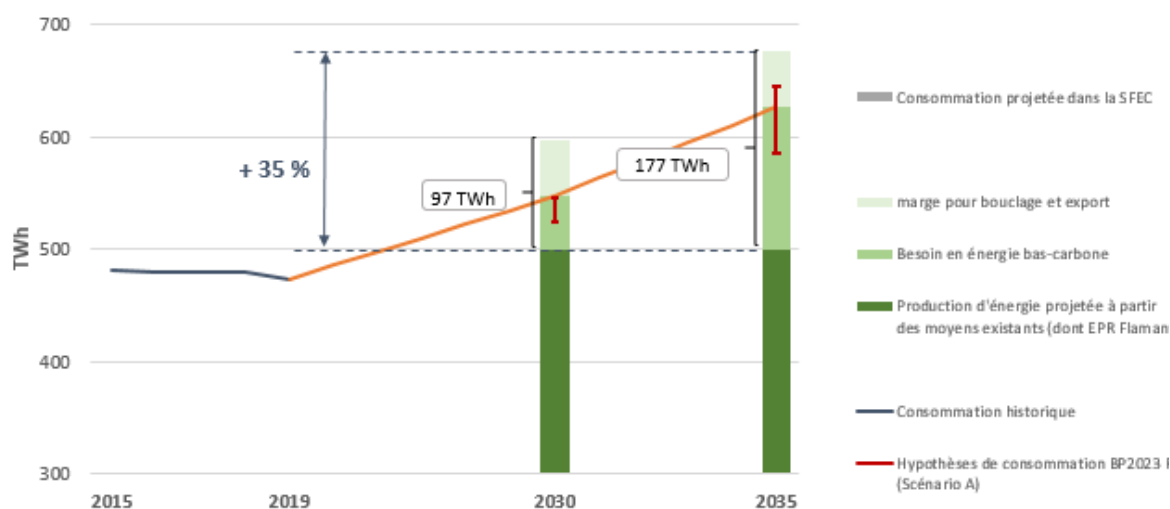


Figure 55: Projection of electricity consumption at 2030 and 2035 (Source: SGPE/DGEC modelling)

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 follows on from precedents and **supports the assumption of a foreseeable increase in biomass consumption for energy purposes in a context of decarbonisation of all sectors of the economy**, and the limited possibility of using other carriers, in particular electricity, for all energy consumption.

In view of this foreseeable increase in biomass consumption, a first challenge is to **deploy measures, tailored to each sector, allowing greater mobilisation to increase the supply of biomass that can be used for energy purposes over a trend scenario**, without prejudice to the priority to be given to food uses (for agricultural biomass), the achievement of climate objectives (forest carbon sink function) and the production of materials (for agricultural and forest biomass).

At this stage, the provisional version of the reference scenario foresees an **increased production of biomass for energy purposes of 228 TWh Ef PCI by 2030, compared to 209 TWh Ef PCI in a trend scenario. This development is based both on improved collection arrangements and on significant**

changes in cultivation practices and/or areas concerned, reflected in the assumptions of the SNBC 3 interim baseline scenario and the guidelines and levers of this strategy.

As it stands, total final energy consumption of biomass could amount to **235 TWh in 2030 under the baseline scenario (compared to 186 TWh in 2030 under the trend scenario)** for an estimated output of 228 TWh PCI. The provisional version of the reference scenario of the Ministry of Energy Transition thus shows a **slight imbalance in biomass demand in 2030**. Moreover, uncertainties about the **projected figures suggest caution as early as 2025**, as consumption in several sub-sectors may be revised upwards. This will be taken into account in the process of drawing up the French energy and climate strategy.

For the underlying bioenergy development, principal elements of the (provisional) baseline:

- The total area with intermediate crops increased from around 3 Mha in 2020 to 4,8 Mha in 2030, and the share of CIVE is increasing (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 dedicated to perennial energy crops increased from 0 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 kt to 357 kt in 2030.
- The amount of methanised manure or slurry is multiplied by 3 by 2030 (874 kt in 2020 compared to 2 872 kt in 2030), while overall livestock numbers are decreasing, reflecting the fact that the percentage of methanised dejection is improving (6 % in 2020 compared to 22 % in 2030).
- Hedgerows are growing by 50 000 km by 2030 (from 734 000 km in 2020 to 784 000 km in 2030)

5.1.1.2. Emission reduction trajectory of the AMS scenario by sector and compliance with 2030 and 2050 targets

Trajectory for emission reductions

France's objectives are:

- — **50 % gross greenhouse gas emissions in 2030 compared to 1990**
- — **55 % net greenhouse gas emissions in 2030 compared to 1990**

In a context where forests are already severely affected by the impacts of global warming, with the impacts of climate change accelerating and amplifying the impacts of climate change compared to what was anticipated in previous studies, the new estimates of changes in the forest sink show a risk of a natural carbon sink deficit.

Work is being done to secure this effort. The government will continue and step up its action, through a balanced approach to the various challenges relating to forests, to preserve the carbon sink: massive support for the forest-based sector under the France Relance and France 2030 plans (in particular through the calls for forestry 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, needed to produce more carbon-sequestering biomaterials), incentives for afforestation, strengthening the means of preventing and combating fires, etc. In addition to these measures, the Government will work towards achieving the French and European objective of reducing net GHG emissions through additional measures to reduce greenhouse gas emissions. Ecological planning is an iterative process of continuously adjusting the roadmap to identify additional levers to compensate identified risk areas through modelling and new analyses and knowledge. These initial results will therefore be taken into account in the preparation of the final SNBC 3 in order to achieve the gross and net targets.

Modelling shows that the measures planned by the Government make it possible to reach -50 % of gross greenhouse gas emissions in 2030 compared to 1990, at 272 Mt.

EPP 3 EPP 3

The graph below presents the results of this modelling exercise, sector by sector (excluding carbon sinks).

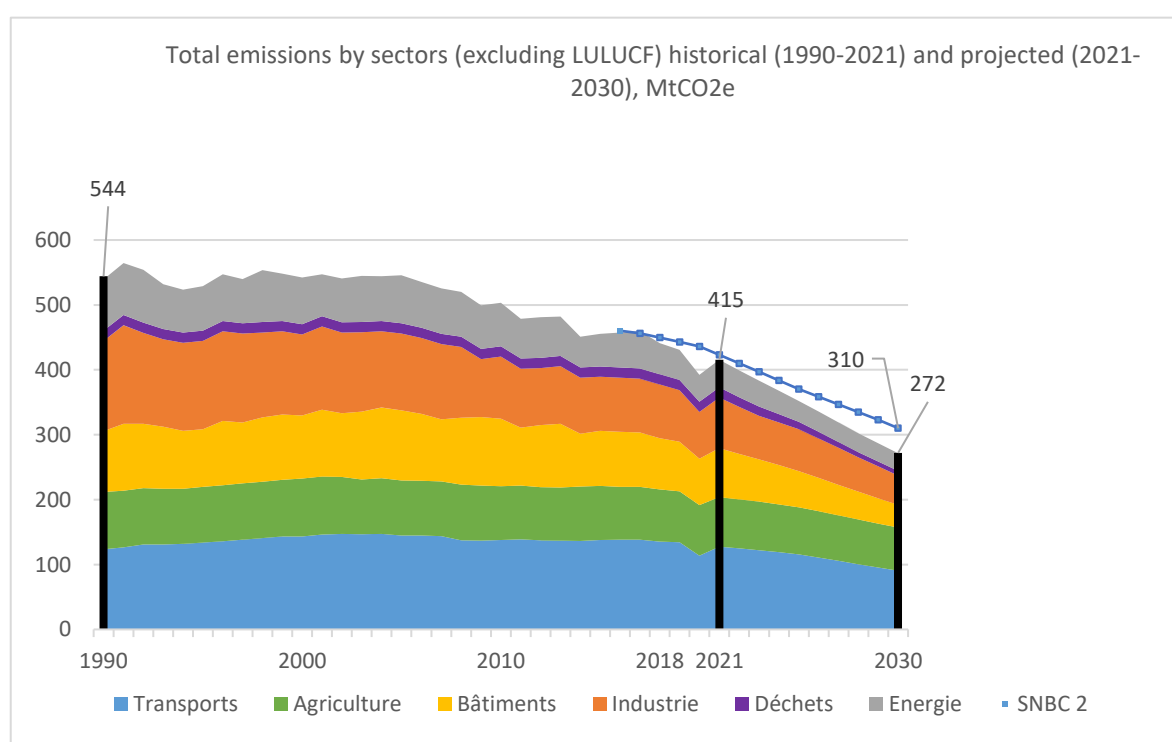


Figure 56: Changes in territorial greenhouse gas emissions (Sources: national greenhouse gas emission inventory, DGEC modelling)

Greenhouse gas emission reductions by sector

The graph below shows the effort sharing by 2030 resulting from the results of the provisional modelling carried out in the context of the preparation of SNBC 3, sector by sector.

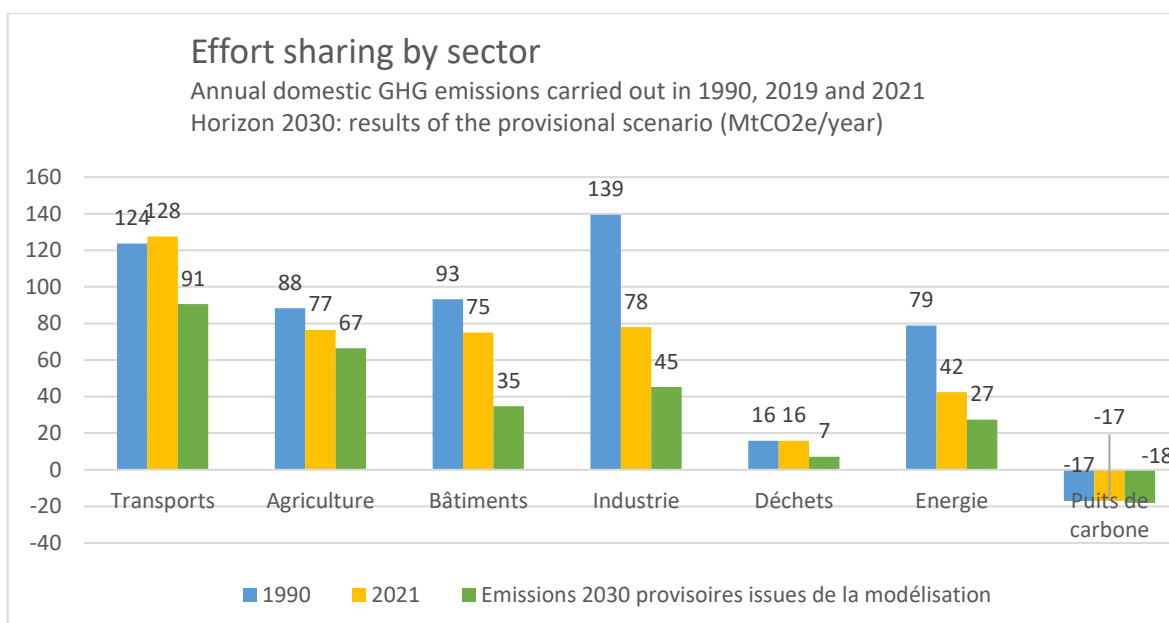


Figure 57: Effort sharing by sector (sources: national Greenhouse Gas Emission Inventory – CITEPA – SECTEN 2023; DGEC modelling)

The emission reductions by sector by 2030 are presented in the following table:

Sectors	Reduction of emissions by sector in the AMS pscenario compared to 2015
Transport	— 34 %
Building	— 59 %
Agriculture/forestry (excluding LULUCF)	— 20 %
Industry	— 46 %
Production of energy	— 45 %
Waste	— 52 %
Total (excluding LULUCF)	— 40 %
LULUCF	— 51 %

Air pollutant emission projections in the AMS scenario

Emissions of air pollutants in the AMS scenario have not yet been quantified in the last baseline scenario, but will be available when the modelling work is repeated. The following table, taken from PNIEC 1, is left to recall.

	2005	2020	2030

SO2 (kt)	457,9	94,8	81,8
NOx (kt)	1416,9	656,5	376,8
NM VOC (kt)	1163,5	590,9	521,1
NH3 (kt)	624,7	596,9	517,1
PM2,5 (kt)	259,7	151,9	118,4

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.

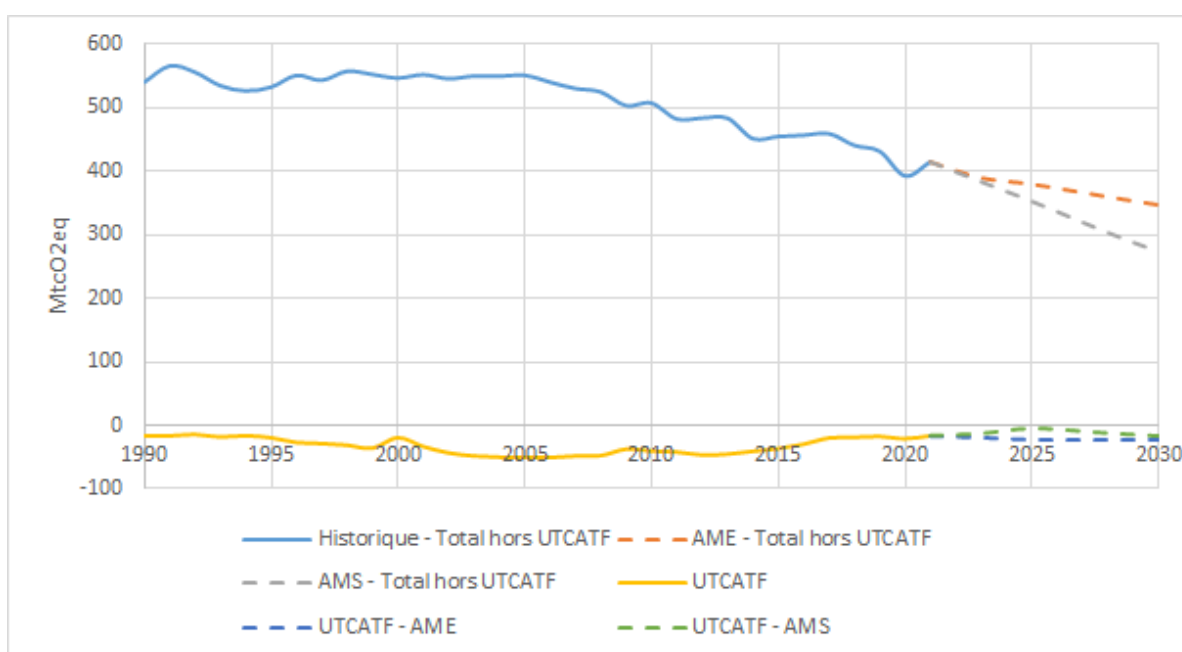


Figure 58: Comparison of AME and AMS projections

The emission reductions in the AMS scenario compared to the AME scenario by 2030 are presented in the following table:

Sectors	Reduction of emissions by sector of 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 23: emission reductions in the AMS scenario compared to the AME scenario by 2030

In particular, the AMS scenario pushes the efforts to improve energy efficiency and develop renewable energies much further than the AME trend scenario.

5.2. Macroeconomic, health, environmental, employment, training, skills and social impacts

5.2.1. Macro-economic impacts

The baseline scenario of the SNBC and of Lap needs to be subject to a macroeconomic assessment. The results of this assessment are then reflected in the SNBC's accompanying report.

This macroeconomic assessment is carried out by comparing the baseline scenario to the trend scenario with the current measures. **It provides valuable elements in terms of the social and economic impact of the assumptions and orientations adopted in SNBC and EPP.**

The main results of the assessment of the SNBC 2 and EPP 2 Reference Scenario are available in the SNBC 2 Accompanying Report which is published on the Ministry's website⁶⁸.

For SNBC and EPP 3, this assessment will be carried out in 2024 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 impact of climate action" by Jean Pisani-Ferry and Selma Mahfouz published in May 2023⁶⁹ on the economic impact of the transition.

- The **climate transition has the magnitude of an industrial revolution** but will need to be twice as fast as possible, and will be driven by public choices more than innovation and markets.
- The **transition is based on three economic mechanisms**: the **reorientation of technical progress** from brown to green, the benefits of which will materialise in the medium to long term; **sobriety**, which implies a change in collective practices and standards and can bring about well-being but represents less than 20 % of the reduction in emissions in 2030; **substitution of capital** (public and private investment) for fossil fuels (main mechanism in 5-10 years)
- An orderly and sufficiently predictable transition for households and firms to anticipate measures and adapt their behaviour accordingly could **generate business gains**. However,

⁶⁸

<https://www.ecologie.gouv.fr/sites/default/files/20200318%20Rapport%20d%27accompagnement%20SNBC2.pdf>

⁶⁹ <https://www.strategie.gouv.fr/publications/incidences-economiques-de-l'action-climat>

these gains are uncertain and will only materialise under the right conditions: absence of frictions on reallocation of capital and labour, international coordination of transition policies, orderly transition, etc. The transition also presents an inflationist risk, which public policies will have to focus on controlling. In any event, the cost of the 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 implies the ability to finance alternatives. Green investments are an additional cost that cannot be financed by small households and represent a very heavy investment for intermediate deciles; even if they are profitable over time, some investments may be non-bankable without public support. 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 problem of financing green investments will also arise for companies, especially smaller 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 thus 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**.

5.2.2. Social impacts

Support to households, particularly small households

The energy transition is characterised by a high level of capital that will 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 that depends on the level of household income.

In the field of housing, renovation measures are, for example, the subject of aid to households under the 'Ma Prime Rénov'. Aid is highly differentiated according to income.

For vehicles, the acquisition of electric vehicles is supported by an eco-bonus. In addition, households scrapping an old polluting vehicle to buy a new car benefit from the conversion premium. The amount of the conversion premium and the conditions on the type of vehicle purchased depend on the level of income. A study published in October 2023 ⁷⁰ indicates, for example, that for the first decile of the population, the difference in the cost of purchasing a new citadine electric vehicle in the new range compared to its thermal equivalent, taking into account all aids and possible maluses, is EUR -5 550 (it is therefore more interesting to purchase an electric vehicle compared to its thermal equivalent). The schemes under consideration for 2024, in particular leasing and revision of the ecological bonus, should further widen this gap to give access to decarbonised mobility for as many people as possible.

Finally, the government has put in place an energy voucher to support modest households in paying their energy bills.

Challenges in skills and jobs

Green planning aims to enshrine ecological objectives in a coherent manner and in line with the reality of implementing the levers to achieve this. In this context, **this strategy aims to incorporate a genuine**

⁷⁰ <https://www.i4ce.org/wp-content/uploads/2023/10/La-transition-est-elle-accessible-a-tous-les-menages.pdf>

industrial and skills dimension. This involves identifying the underlying industrial sectors and associated value chains, then identifying the investment needs in the French economic fabric and the human resources needed for this transition, and finally equipping themselves with the means to attract, train and recruit the people who will contribute to it.

Ecological planning will thus require **the mobilisation of all economic sectors**, taking into account the country's ambition of reindustrialisation and developing innovation for the transition. **Action plans, co-built** between the professional sectors and the State, **will be implemented in all sectors**, along the lines of the action plan for skills in the nuclear sector.

In particular, the following sectors will create a very high number of jobs, some of which require specific skills:

- Energy renovation of buildings;
- Development of low-carbon energy (nuclear and renewable energy);
- Electric vehicle development and conversion of thermal vehicle production sites;
- Reindustrialisation, in particular for “green” industries;
- Conversion and withdrawal of the infrastructure necessary for the distribution of fossil fuels;
- Agro-ecological transition.

At the same time, the retraining or even closure of certain sites, and the decline or even the abandonment of certain activities, will call for **accompanying measures at territorial level** to encourage the movement of labour from one territory to another, by mobilising and coordinating all the bodies and services which can contribute to this.

Important changes in the provision of training will be supported, enabling the acquisition of skills that are transverse to the horizon of carbon neutrality, as well as sectoral skills, as close as possible to occupations. All training organisations and institutions, both initial and continuing training, will be mobilised. Skills and training needs not covered will be identified by job, level of qualification and, where appropriate, by region, in order to trigger the introduction of new training pathways or changes to existing pathways. The sectoral analyses of skills needs drawn up, in particular in the context of France 2030, will be brought to the attention of as many as possible and mobilised to draw up the necessary plans. In addition, a label for ‘colesde la transition énergétique’ could be put in place, within the framework of France Nation verte, for amto read lisibilit é and the appetite 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 French recovery plan, the ‘France 2030’ investment plan and the law of 23 October 2023 on green industry in order to:

- Work with the sectors to align the ambition of their roadmaps with planning issues, ensuring job and skills needs and transverse closure constraints;
- Mobilising large companies (especially publicly owned companies) to have ambitious transition plans in place, thus creating a knock-on effect;
- Increasing the attractiveness of the sectors and professions of the future, through the negotiation of the social partners, the recognition and promotion of skills, the discussion of working conditions and wages, as well as measures aimed at students or employees affected, enabling them to discover these occupations and professional opportunities;
- Develop tools to facilitate the matching of job vacancies and applications, through the identification and characterisation of acquired/required skills;

- Supporting large and medium-sized companies in the implementation of new regulatory requirements;
- Increase the readability of transition aid for VSEs/SMEs;
- Support reindustrialisation projects compatible with the green transition;
- Encourage investment in green innovation.

Finally, the transformation of education systems and continuing training already underway will continue to integrate the challenges of decarbonisation and more generally the green transition, and provide the necessary skills for all targets: *élus, d'ciderspublics andprivs, salariés, consumers.*

5.2.3. Environmental

The EPP and SNBC need to be subject to an environmental assessment.

The implementation of the EPP and SNBC will thus have to take into account the needs of environmental protection and efficient management of resources and space. It is also in the interest of including it in the more comprehensive approach to environmental planning. In particular, the following challenges will be addressed:

- **Quantitative management of water resources in a changing climate:** impact on the production of electricity, link between the challenges of electricity and other uses (including tipping support), consumption of local water for the production of hydrogen. In March 2023, the President of the Republic presented an action plan for resilient and concerted water management. The plan includes 53 specific measures addressing the major challenges of the use of resources, the availability and quality of the resource;
- **Efficient use of space and limitation of artificial take,** linked to the objective “Zero Artificialisation Nette”: spatial planning addresses these challenges, priority use of land from agricultural where relevant (for the photovoltaic energy in particular), the use of agricultural and forestry land, limitation of clearing and systematic compensation;
- **Protection of biodiversity with spatial planning of the NRA enabling** biodiversity challenges to be taken into account upstream (e.g. maritime spatial planning integrating future offshore wind development areas), knowledge development (offshore wind observatory launched in 2022, terrestrial biodiversity and ENR observatory set up 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 emissions of nitrogen oxides and particulate matter linked to fossil fuels, pollutant emissions from the use of nitrogen fertilisers, reduction of pollution from wood heating);
- **Mobilising biomass in accordance with the sustainability criteria laid down in European and national legislation,** including limiting dedicated energy crops, developing CIVE and sustainable forest management geared towards the production of timber;
- **Mobilising biomass in the form of solid fuels by ensuring that the impact in terms of fine particulate matter emissions is limited.** This could include differentiated local targets for the development of individual residential biomass according to local air quality challenges;
- **Development of an anticipatory strategy in terms of strategic metals and minerals** in the remainder of Philippe Varin’s report on critical metals, to secure supplies in French industry for these key components of the energy transition. This strategy is based on several mechanisms:
 - The Critical Metals Project Call of the France 2030 Plan, which supports R &D; and the deployment of industrial capacities in this sector

- The French Observatory of Mineral Resources for Industrial Industries (OFREMI), which aims to bring together French geological and diplomatic expertise at the service of industrialists
- An investment fund dedicated to critical minerals and metals to secure the supply of these key compounds to industry in the energy transition.

5.3. Overview of investment needs

Climate investments in France

The achievement of the green transition requires significant financing needs, primarily private and public in the alternative.

The **additional climate investments needed in 2030** are estimated by Jean Pisani-Ferry and Selma Mahfouz's report "The economic impact of climate action" **at + EUR 66bn/year** net of reductions in carbon investments (+ EUR 101bn/year green and -35bn EUR/year of brown investments). The need for investment is in the order of 2,3 points of GDP per year compared to a climate neutral scenario. This estimate corresponds to a net approach, i.e. estimating the difference between the green investments needed for the transition and the avoided investments in fossil technologies. The estimate also takes into account sobriety measures that reduce the investment burden.

This need for investment corresponds to the investment needs of both public and private actors.

The draft **budget law (PLF) 2024 illustrates the French Government's commitment to ecological planning by presenting for 2024 an unprecedented increase of + EUR 7 billion in appropriations (and EUR 10 billion in commitment) for ecological planning compared to 2023**, bringing total expenditure favourable to the environment of the State to EUR 40 billion. **This EUR 10 billion funding supports the main levers of ecological planning and empowers regions.**

State action corresponds to investment in its own right, but above all to aid to other actors to encourage them to 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 to decarbonise industry, the Heat Fund, etc.

Beyond this commitment, the ongoing work on green planning is intended to **target public funding according to efficiency, incentive and social justice criteria, from a multiannual perspective**, as well as to reduce certain "brown" spending. In order to provide this visibility and multiannual perspective, the government gave a favourable opinion, during the parliamentary review of the Public Finance Programming Act for the years 2023 to 2027, on an amendment requiring the government to transmit to Parliament each year a " **multiannual strategy defining the financing of the green transition and national energy policy**".