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Investing in decarbonisation infrastructure in France

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Editorial by ministers



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Thanks to a thorough environmental and energy planning, the Government has drawn up a sector-by-sector battle plan unparalleled in the leading industrial countries. This unprecedented plan includes short, medium and long term targets, as well as concrete measures to fulfil them and financial resources to support project developers and investors.

Implementing this plan is key to succeed in mitigating climate change and achieving our energy independence. It requires building an ambitious low-carbon infrastructure programme for all energy transition sectors. This decarbonisation plan will give France the means to achieve a 55% GHG emissions reduction by 2030 compared to pre-industrial levels while supporting the development of new industrial sectors in the key technologies of the future. The plan is therefore a core component of our policy to make France the green industry leader in Europe. Its ambition is driven by the momentum of a transition unmatched since the industrial revolution in terms of the scale of investments required, with investment opportunities of approx. €70 billion per year.

To enable investments and deliver on opportunities, we have developed a strategy built on two pillars: an attractive regulatory framework and competitive financial support.

We have designed a simple, predictable regulatory framework, which means less red tape and more legal certainty for investors, with two acts passed in 2023: the Renewable Energy Production Act and the Green Industry Act. Two acts with the same purpose: fast-tracking investments!

At the same time, we are developing the most favorable public financial support framework for investors in Europe. Our aim is to attract international financing with profitable, low-risk investment opportunities to decarbonise France. We are therefore offering investment and operating grants wherever appropriate. Most of all, we are de-risking projects for example by guaranteeing fixed, long-term purchase prices or by insuring against the risk of project counterparty default.

Lastly, as we all know, competitive low-carbon electricity is a key factor for the profitability of decarbonisation investments. This is why we have been taking action, for the last six years, to bring visibility to stakeholders. The electricity market reform that we support and defend will guarantee security of supply for consumers and sustained access to the full costs of the French electricity mix – the most competitive and low-carbon mix in Europe!

All of which makes our motto for the green and energy transition: choose France!

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Introduction

An ambitious multiannual energy plan to meet the needs of the electrification-of-uses in all economic sectors

In 2022, the President of the French Republic set a new course for French energy policy to deliver on carbon neutrality by 2050. The French strategy is based on two pillars.

First, the launch of an ambitious decarbonisation infrastructure programme. These infrastructures will be deployed in all sectors of the energy transition: low-carbon energy generation, grid infrastructures, consumption management and decarbonisation of uses (storage and charging clean vehicles), as well as industrial decarbonisation (CCUS and hydrogen).

Second, the development of new industrial sectors (batteries, hydrogen, wind turbine blades and turbines, etc.) to competitively supply the decarbonisation infrastructures with a wide range of critical technologies.

Private finance is key to the success of this decarbonisation strategy, so the Government has developed an attractive, simple and predictable framework to make France the leading European destination for investment in decarbonisation.

France today can boast a growing number and range of opportunities to invest in decarbonisation. You will find in this brochure the main lines of the French strategy for investment in decarbonisation infrastructures.

Ambitious goals for the deployment of decarbonisation infrastructures

While the overall strategy and deployment targets for major infrastructures will be defined by the Multiannual Energy Plan in the coming weeks, this brochure presents the priority areas for investment and the actions taken to facilitate projects that contribute to this key goal for our climate future. In all areas, the French Government's constant focus is to create an open framework providing legal certainty, fast-track procedures and transparency on the conditions for valuing and supporting key transition assets.

In short, in addition to reducing energy consumption and onboarding society to promote energy savings, renewable and nuclear electricity generation will need to be stepped up to meet rising electricity demand in transport, construction and industry. France will meet these needs thanks to:

- The deployment of all renewable energy sectors (solar power, onshore and offshore wind power, and hydropower) to achieve a generation capacity of approximately 118 GW in 2030 and 140 GW to 175 GW in 2035. This calls for unprecedented levels of renewable energy auctions reviewed to ensure that they are fully compatible with green power purchase agreements (PPAs);
 - For fixed and floating offshore wind turbines, a first large-scale auction (approximately 10 GW) in late 2024/early 2025 for a target of 18 GW of operational offshore wind farms and 26 GW awarded by 2035;
 - At least 5 GW per year in Contracts for Difference (CfD) auctions for solar PV power;
 - At least 1.5 GW per year in CfD auctions for onshore wind power.
- For the deployment of renewable energies, all central government departments will be fully engaged to provide local support for projects and local authorities, and a renewed framework for environmental authorization and local integration will reinforce the legal certainty of installations, a year after a dedicated fast-tracking act halves lead-times.
- Massive deployment of grid infrastructures (electricity grid scale-up, offshore wind power connections and local low-carbon gas distribution networks), energy storage infrastructures and decarbonisation of uses (clean vehicle charging infrastructures and energy-efficient buildings).

In addition to electrification, the phase-out of fossil fuels will entail large-scale deployment of alternative low-carbon power production infrastructures including:

- The development of biogas, which will be ramped up with targets doubled to reach 44 TWh of injected biogas by 2030 and a robust support system using blending mandates to achieve at least 15% of biomethane in the French network by 2030.
- Low-carbon heat thanks to the development of renewable heat (over 250 TWh in 2030) and recovered heat (20 TWh in 2030), both supported by investment grants (Heat Fund with a **€0.8bn** budget in 2024; Fuelwood and Timber Fund) and by an industrial cogeneration aid scheme in the pipeline.

Lastly, the use of innovative technologies will be scaled up to reduce greenhouse gas emissions in the industrial sector with the development of low-carbon hydrogen and carbon capture, utilisation and storage. In both cases, Contracts for Difference (CfDs) auction mechanisms will be used to support the additional cost of low-carbon hydrogen compared to fossil hydrogen and the abatement cost per tonne of greenhouse gas throughout the project. The hydrogen auction mechanism announced last September will deploy 1 GW of electrolysis capacity over the next four years with €4 billion earmarked to cover the entire lifetime of the projects.

A simple, predictable regulatory framework to fast-track project implementation

For the last six years, the Government has been conducting a reform programme to free up investment, facilitate project siting and improve the legal certainty of projects with:

- The Acceleration and Streamlining of Public Action Act (ASAP) of 7 December 2020, which introduced a number of simplifications in environmental legislation and fast-tracking procedures, in particular for projects with a positive impact on the environment.
- The Fast-Tracking Renewable Energy Production Act (APER) of 10 March 2023, which provides for a renewable energy planning system with, in particular, new possibilities for partnerships with project site stakeholders to further project acceptability, new options for Green PPAs and a reform of the framework for authorization and for permit decision litigation procedure aimed at halving lead-times.
- The Green Industry Act (see below).

This set of measures now gives France a more flexible framework meeting better environmental standards and guaranteeing lead-times in line with best European practices.

The Fast-Tracking Renewable Energy Production Act (APER)

The act is based on four pillars:

- Planning, placing local and regional authorities at the centre of decision-making and giving local elected officials leverage for action.
- Streamlining to cut red tape and improve the legal certainty of projects, without giving up our environmental standards.
- Making use of land that has already been built on, or land that presents no major environmental issues to deploy renewable energies, thereby preserving undeveloped land. This act could free up the equivalent of dozens of gigawatts of capacity on already-developed land.
- Sharing and redistributing the value generated by renewable energies – as they become increasingly competitive – to support local and biodiversity protection projects.

The APER Act is the legislative component of the Government's major renewables acceleration plan. The regulatory and organisational aspects were launched in the summer of 2022 with the publication of 36 regulatory texts and the onboarding of prefects and decentralized state services to fast-track the processing of project permit applications.

The act provides for five advances:

- It supports the aim to halve project appraisal time, and secure projects in the event of litigation, alongside the regulatory developments made since summer 2022: up to five years less for a solar project, up to two years less for offshore wind power projects, and a further two years less in the event of a second phase via anticipated government studies.
- It prioritises the use of land that has already been built on or where there are no major issues for the installation of solar panels. In terms of potential, this is the equivalent of at least ten years' worth of the solar power that we need to deploy each year between now and 2050 to meet our targets.
- It assigns a central role to elected local officials and their administrative areas. They need to become the partners of our energy transition by defining for themselves zones for the fast-tracking of renewable energies.
- It paves the way for power purchase agreements for businesses and local authorities for biogas, solar power and wind power. It gives them tools to protect against energy price surges on the markets.
- It provides for better sharing of the value of renewable energy projects in the areas where they are located, by introducing financial support from project promoters to local and regional authorities, in particular to assist constituents with the energy transition and to protect biodiversity.

Development of new industrial sectors for decarbonisation

The decarbonisation battle will not be won without developing key new technologies. To this end, the Government has launched the “France 2030” Plan to fast-track the green and energy transition by promoting innovation, investment, and social and territorial cohesion. The priorities of this €54bn five-year plan are to promote innovation and massively invest in the industrial, transport and energy sectors of the future in order to build a decarbonised, resilient France. The “France 2030” Plan supports the entire innovation lifecycle through to industrialisation. At the same time, the Government is supporting French and international businesses with their investments nationwide and with their research and innovation efforts. The new Pluriannual Research Policy Act for 2021-2030 encourages links between public research and private innovation. It also improves public research funding, promotes scientific excellence and improves the attractiveness of the research sector for the benefit of all economic players.

The Green Industry Act: Supporting investment in industrial decarbonisation

France has an action plan to become a leader in green technologies and industrial greening. Several measures have already been announced, in particular those in the Green Industry Act. By meeting the needs of industry, this bill will fully contribute to promoting investment in decarbonisation:

- The deployment of industrial sites will be supported by halving permit issuing lead-times and streamlining procedures, cleaning up brownfield sites and opening “turnkey” industrial sites, etc.
- The most virtuous firms will be boosted: new “Triple E” ecolabel (European Environmental Excellence), changes to the public procurement rules, public aid conditional on firms having a virtuous pathway, allocation of the green bonus conditional on the carbon footprint of electric vehicles, etc.
- In terms of training, the Green Industry Act aims to improve the attractiveness of the industrial sector and train more engineers and technicians. For example, the bill provides for the compulsory posting of graduate employment rates and pay brackets on all careers guidance platforms to steer students and their families towards the industrial sectors of the future.
- To leverage and steer private savings toward funding decarbonisation, the creation of the Climate Future Savings Account will serve to make long-term investments in renewables and corporate decarbonisation. New government-certified labels for funds investing in decarbonisation will also be created and extended to private assets. To ensure that savers have access to these funds, life insurance policies will be required to offer at least one green-labelled unit of account for each of the government-certified labels. A number of measures will promote private saver access to private equity and infrastructure funds: the national regulatory framework will be amended to foster the formation and distribution of European long-term investment funds (ELTIF 2.0) and certain life insurance and retirement savings manager-guided profiles will now be required to provide for a minimal proportion invested in unlisted securities key to financing the energy transition.
- Under the Budget Bill for 2024, the Government is also developing a new Green Industry Investment tax credit to support productive investment in factories manufacturing solar panels, wind turbines, heat pumps and batteries and producing key sub-components and materials for their manufacture.

This last year has seen growing numbers of industrial installation projects supported by the strategic project guarantee scheme in such sectors as battery manufacture, sustainable chemistry and wind propulsion systems. This guarantee designed to facilitate funding for projects considered to be “strategic for the French economy internationally” covers the risk of default by a debtor¹ for business, political, monetary and disaster reasons.

¹ The minimum guarantee is €10 million (no maximum amount) and the percentage of cover is 80%. Guarantee pricing (calculation of premiums) is in line with market prices.

Investing in renewable energies in France

Assertive sector development and support drove up the share of renewables in final energy consumption in France to 20.7% in 2022, representing a 1.3% increase compared to 2021. France has a similar level of renewables compared to its leading European partners (Germany, Spain and Italy).

France has set targets equal to the challenge:

GW	2022	2030	2035
Solar power	16 GW	54 - 60 GW	75 - 100 GW
Onshore wind power	21 GW	33 - 35 GW	40 - 45 GW
Offshore wind power	0.5 GW	3.6 GW	18 GW
Hydropower (inc. PSH)	26 GW	26 GW	28 GW

Investments in renewable energy generation facilities benefit from mechanisms that guarantee project promoters a steady revenue stream over time. This reduces asset risk for investors, while keeping energy costs under control for consumers. This is an advantage for ensuring the long-term viability of projects and for facilitating the financing of these investments. All renewable energy support mechanisms are notified to the European Commission and are entirely consistent with the current “State Aid” guidelines, contributing to the legal certainty of aid contracts.

The Bpifrance Ampère project will manage a **€68 million** state-backed guarantee fund to protect investors from the risk of counterparty default by industrial firms under green power purchase agreements (PPAs).

Offshore wind power

1. Many investment opportunities

France has the second largest offshore wind power potential in Europe. The French Energy Plan provides for at least 1 GW of wind farm projects (both fixed and floating) to be commissioned every year starting in 2024. This target will be significantly increased to have 18 GW in operation by 2035, representing 12% of French electric power capacity, and at least 40 GW to 45 GW by 2050. The Multiannual Energy Plan, due for adoption in 2024, will define the multiannual schedule for auctions for all renewable technologies. Offshore wind farms will be developed in areas already identified, and will be planned from 2024 onwards for France’s four seabords,

with an auction for 8 GW to 10 GW by the end of 2025, as soon as the plans have been finalised for these seaboard.

2. Attractive public financial support

The Government supports commercial wind power projects through a contract for difference mechanism that guarantees project promoters a steady revenue stream over time. This reduces risk for project developers while keeping energy costs under control for consumers. French auctions include index-linking clauses to adjust PPA prices to inflation for the main project cost components.

Pilot floating wind farms qualify for publicly funded support in the form of investment aid under the Investment Programme for the Future (PIA) with a mix of grants and refundable advances.

These installations will be supported during the operational phase by a guaranteed feed-in tariff for generated electricity of €240/MWh for 20 years.

3. A simple and predictable regulatory framework

The 2023 Fast-Tracking Renewable Energy Production Act provides for public participation in the joint development of offshore wind farm spatial planning and maritime spatial planning. In 2024, a map of suitable areas for offshore wind farms will be adopted to give stakeholders more transparency. This planning will fast-track the development of wind power with one or more large-capacity auctions (for a total of approximately 10 GW).

At the same time, port planning is underway to define relevant investments in the ports of the two major seaboard. These new industrial investments concern the manufacture of the main offshore wind turbine components: blades, nacelles, towers, foundations, floaters, etc. These port investments are supported by the "France 2030" Plan in the same way as industrial investments ("Indus ENR" call for tenders), which will be scaled up with the introduction of a Green Industry Investment tax credit.

Companies that have chosen France

The first French offshore wind farm was commissioned off Saint Nazaire in late 2022 and 1 GW of capacity is nearing completion in Saint-Brieuc and Fécamp. A further 1.5 GW will be commissioned in Dieppe-Le Tréport, Courseulles-sur-Mer and Yeu-Noirmoutier by 2025/2026.

Three pilot wind farms are being built in the Mediterranean (Leucate Le Barcarès, Gruissan and Faraman Port-Saint-Louis-du-Rhône) and are scheduled for commissioning in late 2023 or early 2024.

The conclusion of procedures for the award of three floating offshore wind farms in the Mediterranean and South Brittany is scheduled for 2024. Each of these farms will have a capacity of 250 MW, making France the leading European country in terms of floating offshore wind farm ambitions.

These offshore wind farms and future offshore wind farms have the benefit of a buoyant national ecosystem and a strong integrated industrial sector. For example, the Saint-Brieuc wind farm has brought on board the following companies:

- Siemens Gamesa to manufacture the turbines in the Le Havre factory,
- Prysmian to manufacture the array cables in the Montereau-Fault-Yonne and Gron (Yonne) factories in France,
- Navantia Windar to manufacture a good part of the foundations in Le Havre,
- Nexans, a trailblazing French company, to manufacture and lay the export cables,
- Eiffage Metal and Engie Solutions for the offshore substation.

Onshore wind power

1. Unique opportunities

France has the highest onshore wind power potential in Europe. As at 30 June 2023, French onshore wind farm capacity stood at 21.6 GW. The country could theoretically count on 80 GW of potential onshore wind power spread across 10,000 km².

France aims to achieve 33 GW to 35 GW of onshore wind power by 2030. Achieving this target means maintaining the pace of onshore wind farm development at a minimum of 1.5 GW per year of auctions from 2024 onwards. French auctions include index-linking clauses to adjust PPA prices to inflation for the main project cost components. These clauses were readjusted in 2022 and 2023 to take account of the particular inflationary context.

This target also calls for a plan to replace existing units for efficient wind farm renewal over the 2025-2035 period.

In addition, certain innovations such as the increase in tower size could free up extra generation capacities and reduce the number of towers to facilitate acceptance of these installations.

2. Attractive public financial support

France supports onshore wind power projects through a contract for difference mechanism that guarantees project promoters a steady revenue stream in the long term.

This mechanism is available to wind farms of six wind turbines or less with a unit capacity of a maximum of 3 MW. For larger projects, calls for tenders consisting of several bidding periods a year are available.

Support schemes enabled the onshore wind power sector to install nearly 2 GW of capacity in 2022. Auctions hit an all-time high in France in 2023, with a total of 1.2 GW of onshore wind power projects being selected in the most recent bidding period.

3. A simple predictable regulatory framework

France has clarified and unified its permit issuing procedures since 2015 to give project promoters transparency and certainty by halving lead-times. Today, the rate of rejection of wind power projects has come down to less than 20% and the average target lead-time is 18 months. The act of 10 March 2023 also provides for a simplified impact study for repowering projects.

In addition, a number of measures have been taken to foster the acceptability of wind power projects. The act of 10 March 2023 provides for bottom-up renewables planning by defining renewable energy fast-track zones in each geographic area.

Increasingly attractive projects

The fourth period of the auctions issued as part of the 2019-2028 Multiannual Energy Plan was marked by an unprecedented level of bids resulting in the award of nearly 1.2 GW, a record level for a single period equivalent to the electricity consumption of approximately 500,000 households.

Solar PV

1. Significant potential for deployment

France is pursuing a domestic target of 100 GW installed capacity of solar PV by 2050. This target will be raised in the draft energy plans to be published in the coming weeks.

To meet this ambitious target, France intends to double the pace at which new capacity is developed to 5 GW/year whilst aiming at 7 GW/year, one of the fastest rates in Europe.

2. Attractive public financial support

France is supporting solar PV projects through feed-in tariffs and feed-in premiums, depending on the size of the project, guaranteeing a steady revenue stream for project promoters in the long term.

A feed-in tariff scheme is available to solar PV projects producing up to 500 kWp on buildings, sheds or canopies. For the largest projects, various types of invitation to tender (for ground-mounted, rooftop, canopy or self-consumption projects) covering several bidding periods a year are available.

Support schemes for the solar PV sector enabled installation of some 2.5 GW in 2022, a figure that has been steadily growing over recent years owing to competitive tariffs. Invitations to tender were also at an all-time high in France in 2023, with a total of 1.5 GW of projects being selected over the most recent solar PV tendering period, for example.

3. A simple and predictable regulatory framework

It currently takes between 18 to 20 months to complete a project (from permits and implementation). France recently passed legislation to establish areas for the purpose of promoting and fast-tracking project development.

To strike a balance between climate change prevention, land development and the loss of biodiversity, the legislation unlocks the potential of lands which have already been built on and land with no major environmental issues in order to conserve natural and undeveloped areas. It will facilitate use of:

- Land next to roads, motorways, railways and waterways;
- Brownfield sites on the coastline, a list of which will be laid down by decree;
- Existing outdoor car parks larger than 1,500 m², which will be able to install solar panels over at least half of their area.
- Mountain towns with their own area plans will now be able to authorise installation of PV panels outside built-up areas.

These measures will make it possible to install renewable energy projects producing the equivalent of several dozen gigawatts.

An emerging industry

The "France 2030" Plan is to promote the growth of a sovereign and sustainable solar PV industry for production of low-carbon energy. Various calls for projects, managed by ADEME, are supporting development of SME-promoted innovations and capital investment in industrial capacity.

This support will soon be stepped up with the creation of a tax credit allowing manufacture in France, at attractive prices, of solar panels themselves produced with low-carbon electricity.

Low-carbon heat

1. More and more investment opportunities

Heat currently accounts for a little under half (43%) of final energy consumption in France and only about a quarter comes from renewable sources. France is counting on a large increase in renewable heat production and faster growth of district heating and cooling networks in order to phase out fossil fuels quickly.

France is set to more than double its targets for renewable and recovered heat by 2035, increasing its use from 183 TWh in 2021 to 419 TWh to meet the high target for 2035.

To this end, all renewable heat supply chains will be called on to play their part, while more use will be made of waste heat recovery, and national targets will be set. The biggest increase in production will come from the large-scale deployment of heat pumps. Development of solar thermal energy, biogas and geothermal energy is also essential.

2. Attractive public financial support

The Heat Fund provides assistance for development of renewable and recovered heat in every area of the economy. Established in 2009 and run by ADEME, it has allowed large-scale deployment of renewable heat systems. Between 2009 and 2022 this investment aid supported over 7,100 projects, totalling €3.68bn out of an overall investment of €12.4bn. This policy of large-scale aid has led to annual heat production reaching 42.6 TWh. Increased by 40% in March 2022 to reach €520m for 2022, the Heat Fund will continue its upwards path in coming years.

Fast project roll-out

The Heat Fund made it possible to finance some 1,900 solar heating systems and approximately 198,000 m² of collectors between 2009 and 2020. Some fifteen large-scale plants covering between 1,000 and 15,000 m² have been set up. The 2023 call for large-scale solar heating system projects is meant to continue support for deployment of this type of system.

The government has also published a geothermal energy action plan to produce enough geothermal heat in 15 to 20 years to save the equivalent of 100 TWh/year of gas. This ambitious plan covers six main fields and some fifteen measures.

A new heat pump manufacturing supply chain

A plan for one million heat pumps in France by 2027 has been published by the government to develop the manufacture and installation of heat pumps in France. This plan contains a number of measures:

- Introduction of a Green Industry Investment tax credit in the Budget Bill for 2024, at a rate of at least 20% of the plant's capital cost, or higher if the project is sited in certain priority areas or if it is carried out by an SME;
- More support for research and development, with a suggested budget of €30m and eligibility of heat-pump R&D projects for the Demo-TASE call for projects issued as part of the France 2030 Plan;
- Consideration of heat pumps' environmental performance to determine their eligibility for support schemes (MaPrimeRénov).

Biogas

1. Growing potential

France has set itself the target of raising the share of renewable energy in gas consumption to 10% by 2030. The Multiannual Energy Plan makes provision for:

- Significant new central-government funding of €9.7bn to support the development of methanisation;
- A biogas production target of 14 TWh/yr HHV in 2023, including 6 TWh/yr HHV for upgraded biogas injected into the natural gas grid, and 24 to 32 TWh/yr HHV by 2028, including 14 to 22 TWh/yr HHV for injected biogas.

It is planned to increase biomethane production, with a potential target of 44 TWh/yr HHV by 2030.

2. Attractive public financial support

A number of support schemes have been introduced:

- Feed-in tariffs since 2011 for biomethane injected into the natural gas grid for projects with a production capacity below 25 GWh/yr.
- Feed-in tariffs for biomethane injected into the natural gas grid following an invitation to tender, designed to support projects with a production capacity over 25 GWh/yr. The first invitation to tender will be issued in late 2023. Others will follow in 2024.

Further support schemes are in the pipeline:

- Contracts for difference for uninjected biomethane are designed to support anaerobic digestion, including in areas remote from the natural gas grid, by promoting conversion of biomethane into vehicle fuel (CNG);
- The biogas production certificate scheme is designed to fast-track the development of methanisation, with injection of the upgraded gas into the natural gas grid, by requiring natural gas suppliers to produce biogas production certificates. Natural gas suppliers will be able to obtain these certificates by producing biogas injected into the grid or from biogas producers. The extra cost of biomethane in relation to natural gas will be paid by suppliers to producers and passed on directly to customers.

More and more projects

Since 2017, facilities injecting biogas into the grid have increased over twentyfold. France now has 591 facilities with a production capacity of 10.5 TWh/yr, which is 13% more than at the end of 2022.

In 2022, 7.0 TWh of biomethane was injected into the natural gas grid, exceeding the 2023 target. Installed capacity in late September 2023 was almost 11 TWh/yr.

Deep decarbonisation of **industry: France's support for** disruptive technologies

Carbon capture, utilisation and storage (CCUS), new investment opportunities in France

1. A national priority

France has begun a consultation on a draft CCUS Strategy to capture and store between 4 and 8 MtCO₂ by 2030, depending on the progress of industrial projects concerned. The first phase would focus on the export hubs of Dunkirk, Fos sur Mer and Le Havre before a fast roll-out up to 2035 to cover France's main industrial sites (capturing some 12 MtCO₂).

Deployment of CCUS requires significant investment around capture clusters and the potential roll-out of a dedicated transport network covering several hundred kilometres depending on the industrial projects concerned (from 500 to 1,000 km by 2030, with the investment needed put at €4bn, and possibly extending to 4,800 km by 2050).

2. Vigorous public financial support

The France 2030 Plan provides for a budget of €5.6bn to support decarbonisation projects for industrial sites and speed up the pace of investment.

In addition, a precise map of energy infrastructure needs will be funded under the France 2030 Plan. Four major industrial areas (Fos, Dunkirk, Havre/Seine and the Saint Nazaire estuary) have already been selected for the first phase of this work.

In the second half of 2023 the government will prepare an aid scheme providing larger subsidies throughout the lifetime of industrial deep decarbonisation projects, including the ability to fund the additional cost of decarbonisation per tonne abated, through carbon contracts for difference based on international best practice (such as the Sustainable Energy Transition Scheme, SDE++, launched in the Netherlands). This carbon contracts for difference scheme will be introduced in France in the course of 2024, with an initial public consultation late 2023, in preparation for pre-notification of the support scheme.

As for the development of transport infrastructure and geological carbon storage capacity, a call for projects will be issued before the end of the year to fund research into the carbon storage potential in France, before clarifying the regulatory and support framework for transport infrastructure: the national regulator is to provide a progress report by the end of the year. The framework will be established in consultation with the relevant investors.

Some promising projects

A number of French industrial decarbonisation projects have been selected by the EU ETS Innovation Fund, including CO₂ capture and/or storage projects. Egiom's K6 project to decarbonise a cement works in Lumbres (€153m of support for €255m of investment), and the CalCC project promoted by AirLiquide and Lhoist/Chaux et Dolomies du Boulonnais to decarbonise a lime production plant at the Réty site (€125m of support for €200m of investment). A project for producing methanol from renewable hydrogen and CO₂ captured in the Lafarge factory in Le Teil (Auvergne-Rhône-Alpes region) has also received funding from the Innovation Fund.

Low-carbon and renewable hydrogen

1. New investment opportunities

France's strategy seeks to switch existing hydrogen production to low-carbon production and meet the needs of new manufacturing practices and heavy vehicles.

Towards this end, France is aiming for 6.5 GW of electrolysis capacity by 2030 and over 10 GW by 2035.

France's priority in developing a hydrogen transport network is to accelerate its deployment within hubs and connect them to storage infrastructure. These hubs will be mainly in industrial areas and will meet a need for some 500 km of transport pipelines. The development of an inter-hub network could then be considered depending on needs.

2. Proactive public financial support

The government has set aside €9bn to support deployment of low-carbon hydrogen in France, of which €4bn is earmarked for a support mechanism for low-carbon and renewable hydrogen production through contracts for difference (CfDs) awarded through auctions, to provide 1 GW of electrolysis capacity. This mechanism will be used to support projects not only for the initial investment phase but also throughout their lifetime. It will set a price for a kilogram of low-carbon hydrogen over a ten-year period that is guaranteed to be competitive with grey hydrogen, using a CfD awarded through a transparent, non-discriminatory auction reflecting European best practice. The selection process will be launched by the end of 2023.

In addition, since 1 January 2023 renewable hydrogen has been eligible for tax credits under the incentive tax for use of renewables in transport (TIRUERT), thus increasing the contribution of hydrogen to reducing the carbon footprint of production of conventional fuels (refining),

biofuels and e-fuels of all kinds. From 1 January 2024 low-carbon hydrogen will also be eligible for TIRUERT tax credits. The TIRUERT blending targets for road fuels are set to rise further, to reach the RED3 Directive target of a minimum 14.5% reduction in fuel GHGs by 2030.

A growing number of industrial projects

- Four gigafactories built to produce electrolysers (McPhy, Elogen, John Cockerill, Genvia),
- Hydrogen vehicles (Hyvia for commercial vehicles, Alstom for locomotives),
- Fuel cells for road (Symbio) and marine use (Hydrogène de France),
- All the key components of the upstream value chain (Plastic Omnium, Arkema, Michelin and Gen-Hy for membranes, Forvia for tanks).

Over €2.7bn of support has thus been granted so far to develop the hydrogen industry in France.

Developing electric vehicle charging infrastructure in France

Investment opportunities: a target of 400,000 public charging stations by 2030

Electromobility cannot be developed without a close-knit, high-quality network for electric vehicle charging. After reaching the threshold of 100,000 public charging stations and 1.5 million charging points in all, France means to continue the roll-out to meet the projected growth in the electric vehicle fleet by achieving 400,000 public charging stations by 2030. The focus will be on power targets to ensure proper coverage for every type of long-distance journey.

Support mechanisms for a range of uses

Facilities can be financed through the Advenir+ energy savings certificate programme, which provides a one-off set payment per kW for every charging point installed: this scheme will be extended in order to secure a national network of charging infrastructure and an output distribution that meets the requirements of the Alternative Fuels Infrastructure Regulation (AFIR), converting the scheme into “infra-like” support in the form of regular capacity payments awarded on a more competitive basis. In addition, various methods of prefinancing the public infrastructure needed for connecting home charging points have been possible as a result of including 75% of connection costs in the network tariff.

The share of renewable electricity supplied through public charging stations is eligible for TIRUERT tax credits, multiplied by a factor of 4. This allows a tax credit of some €80/MWh for electricity supplied by public charging stations.

Financing the energy retrofitting of public buildings

Investment opportunities: ambitious targets for energy renovation of public buildings (some 400 million square metres)

Property belonging to central and local government totals some 400 million square metres. It will have to be renovated in the coming years in order to meet the ambitious target set by the Service-sector Buildings Decree on of a 60% reduction in energy consumption by buildings by 2050.

To finance this work, central government and local authorities have to draw on all available public and private funding.

A regulatory framework facilitating energy performance contracts with private on-bill financing

As a result of the law of 30 March 2023 opening up on-bill financing to central government, government-funded institutions and local authorities in order to encourage energy renovation work, and thanks to its implementing decree published on 4 October 2023, it is now easier for public entities to use on-bill financing for building renovation work. In practice, this allows arrangements in which the contractor is responsible for financing and performing the work in return for payment of a long-term rent by the relevant public entity. Public entities will therefore be making greater use of this arrangement to finance such investment in the coming years, thus creating new opportunities for private investors in this field.

Overview of targets and government support measures to fast-track investment

	Target	Support measures
Decarbonisation of the economy	Achieving carbon neutrality by 2050	<ul style="list-style-type: none"> - New government-certified labels created for funds investing in decarbonisation and extended to private assets. - Strategic project guarantee scheme covering risk of default by a debtor. - Support for productive investment in factories manufacturing solar panels, wind turbines, heat pumps and batteries, in the shape of a Green Industry Investment tax credit.
Offshore wind	0.5 GW in 2022 3.6 GW in 2030 18 GW in 2035 Developing new capacity at a rate of 8 to 10 GW in 2024 and then at least 1 GW/yr subsequently	<ul style="list-style-type: none"> - Contracts for difference guaranteeing a steady revenue stream for project promoters in the long term and containing inflation-linked cost escalation clauses; feed-in tariffs. - Guarantee fund protecting investors from the risk of counterparty default by industrial firms under power purchase agreements concerning electricity from renewable energy sources
Onshore wind	21 GW in 2022 33 to 35 GW in 2030 40 to 45 GW in 2035 Developing new capacity at a rate of at least 1.5 GW/yr	<ul style="list-style-type: none"> - Financial support in the form of grants and refundable advances for pilot floating wind farms. - Support for development of the wind power and solar PV industries in the France 2030 Plan and a tax credit under the Green Industry Bill
Solar PV	16 GW in 2022 54 to 60 GW in 2030 75 to 100 GW in 2035 Developing new capacity at a rate of 5 to 7 GW/yr	<ul style="list-style-type: none"> - Support for improvement of port areas
Low-carbon heat	Renewable heat: over 250 TWh in 2030 Recovered heat: 20 TWh in 2030	<ul style="list-style-type: none"> - Investment aid for heat networks, boilers, geothermal energy, methanisation, etc. (Heat Fund) and support for combined heat and power. - Support for developing a heat pump industry in the France 2030 Plan - Support for developing a pellet manufacturing industry through a call for projects
Biogas	44 TWh injected into the grid in 2030	<ul style="list-style-type: none"> - Support using blending mandates, to reduce investment risk. - Feed-in tariffs and contracts for difference for biomethane. - Biogas production certificates to fast-track the development of methanisation (the extra cost of biomethane in relation to natural gas is passed on directly to customers).

	Target	Support measures
Biofuels and synthetic fuels	50 TWh by 2030 to achieve a 14.5% reduction in fuel GHGs according to the RED3 Directive	<ul style="list-style-type: none"> - Incentive tax for the use of renewables in transport (TIRUERT) to calculate production of biofuels and synthetic fuels as €/MWh blended. - France 2030 Plan call for projects to develop sustainable aviation fuels
Hydrogen	6.5 GW by 2030 10 GW by 2035 The support mechanism for hydrogen production could help provide 1 GW by 2026.	<ul style="list-style-type: none"> - Contracts for difference to offset the additional cost of low-carbon or renewable hydrogen in relation to fossil-based hydrogen. - Eligibility of renewable and low-carbon hydrogen for TIRUERT tax credits. - Support for conversion of factories requiring process modifications to blend hydrogen.
CCS	Between 4 and 8.5 MtCO ₂ captured annually by 2030 Between 15 and 20 MtCO ₂ captured annually by 2050	<ul style="list-style-type: none"> - Contracts for difference to offset the additional cost of abatement per tonne of greenhouse gas. - Regulatory and support framework for transport infrastructure.
EV charging infrastructure	400,000 public charging stations by 2030	<ul style="list-style-type: none"> - Advenir+ programme providing a one-off set payment per kW for every charging point installed. - TIRUERT tax credits increased for share of renewable electricity supplied through public charging stations.
Energy retrofitting of public buildings	Annual rate of 370,000 full retrofits from 2022, then 700,000 full retrofits per year from 2030	<ul style="list-style-type: none"> - Contract allowing use of private financing for energy renovation of public buildings.

These rates should be compared with the rate at which our European neighbours have awarded contracts in the past. For example:

- Offshore wind: under 1 GW/yr in the United Kingdom; approximately 0.7 GW/yr in Germany;
- Onshore wind: under 1 GW/yr in Spain; approximately 0.5 GW/yr in Italy;
- Solar PV: 4 GW/yr in Germany; under 2 GW/yr in Italy.

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