RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

EXPERTISE FRANCE
GROUPE AFD

The Hydrogen Ecosystem in France

Overview of France's hydrogen initiatives, discoveries, and future plans
Presentation for Louisiana State Congress Clean Hydrogen Task Force
April 8th 2025

emmanuel.henriet@expertisefrance.fr

RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

EXPERTISE FRANCE
GROUPE AFD

France's Commitment to Hydrogen

National strategy to achieve carbon neutrality by 2050.

Establishment of giga factories for electrolyzers.

Goals and initiatives under France 2030 Plan.

FRANCE 2030

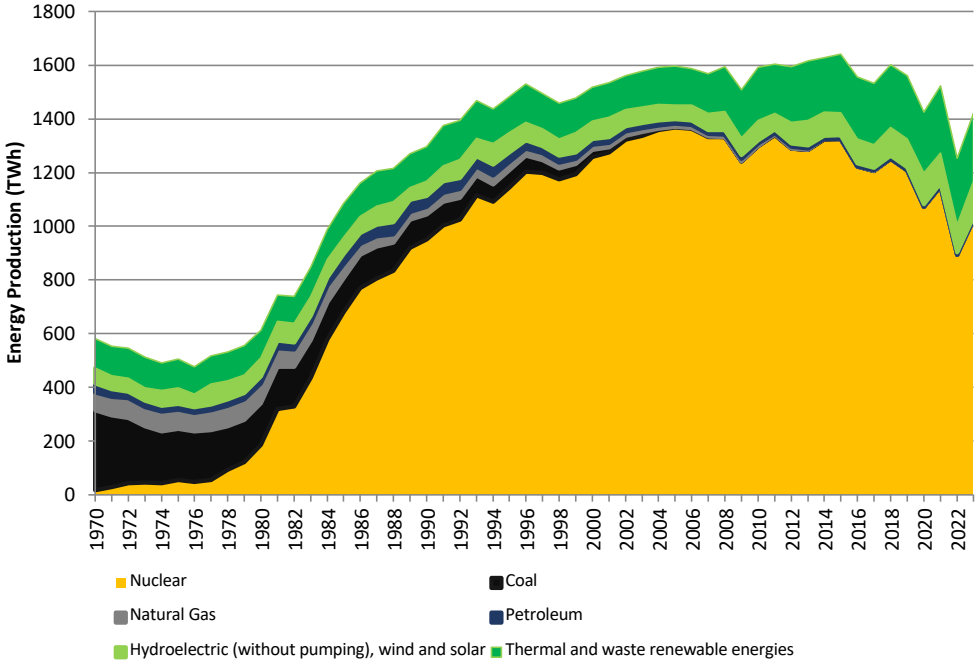
HYDROGEN (capacity electrolysis installed) Data extracted from France last MultiYear Energy Planning Proposition (PPE 3)	How many?	0 GW (as of 2022)	Up to 4.5 GW (9-19 TWhpci) Planned for 2030	Up to 8 GW (16-40TWhpci) Planned for 2035
	How?	Investments in equipment in the sector, a support mechanism for the production of renewable and low-carbon hydrogen for industry and incentives for consumption in transport through the reduction of the carbon intensity of fuels		

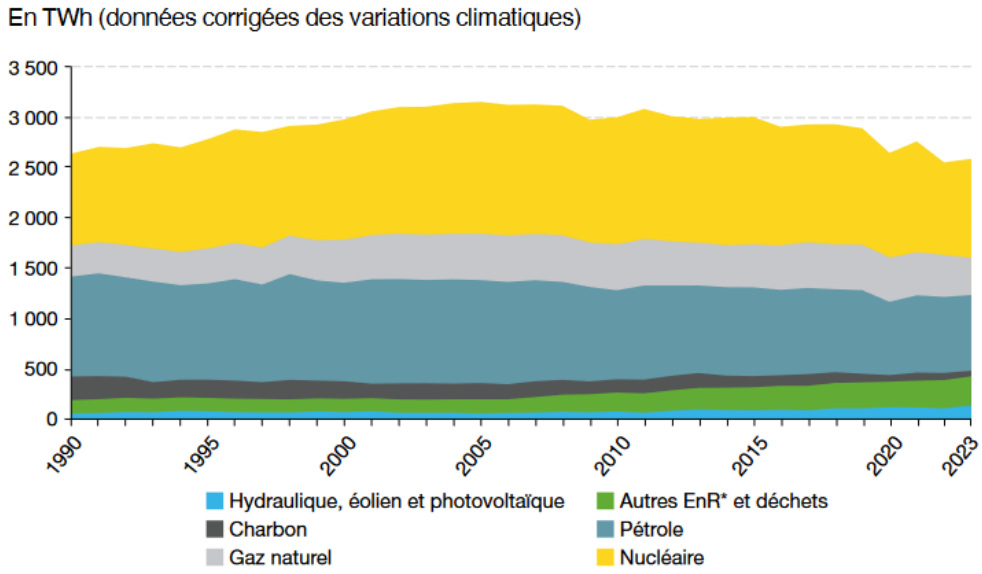
France Hydrogène
Engagée pour la transition écologique

RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

EXPERTISE FRANCE
GROUPE AFD

Background and context on energy in France





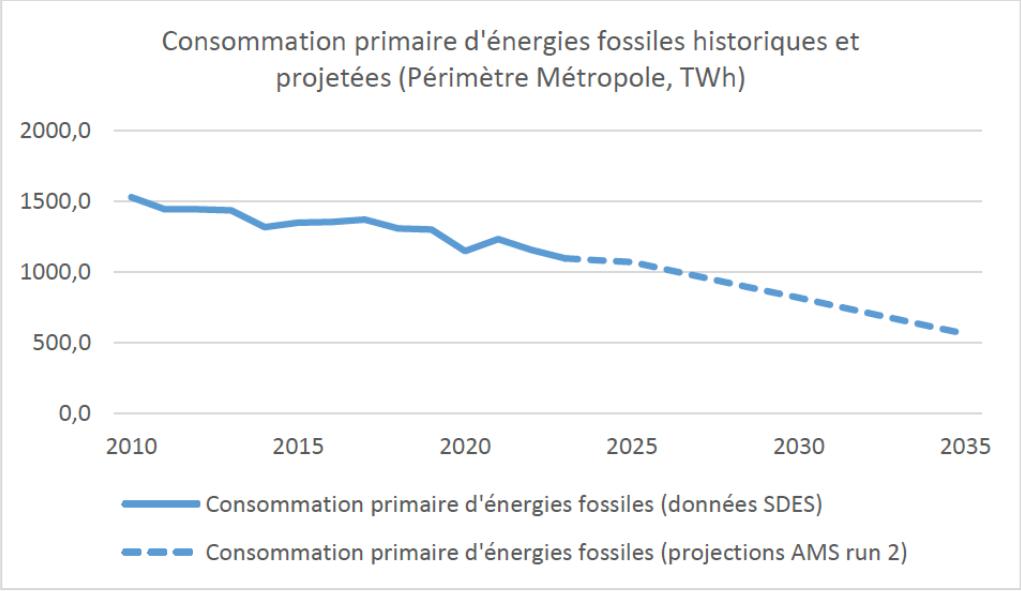
** EnR = énergies renouvelables.*
Champ : jusqu'à l'année 2010 incluse, le périmètre géographique est la France métropolitaine.
À partir de 2011, il inclut en outre les cinq DROM.
Source : *SDES, Bilan énergétique de la France*

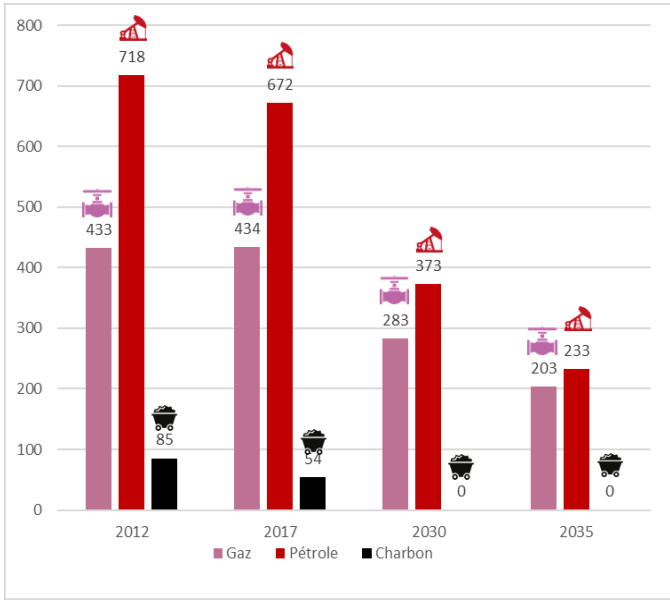
Source : France **Primary Energy Production** (SDES) 2024 report, Bilan Énergétique de la France

RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

EXPERTISE FRANCE
GROUPE AFD

Dependancy to Fossil Fuels in France



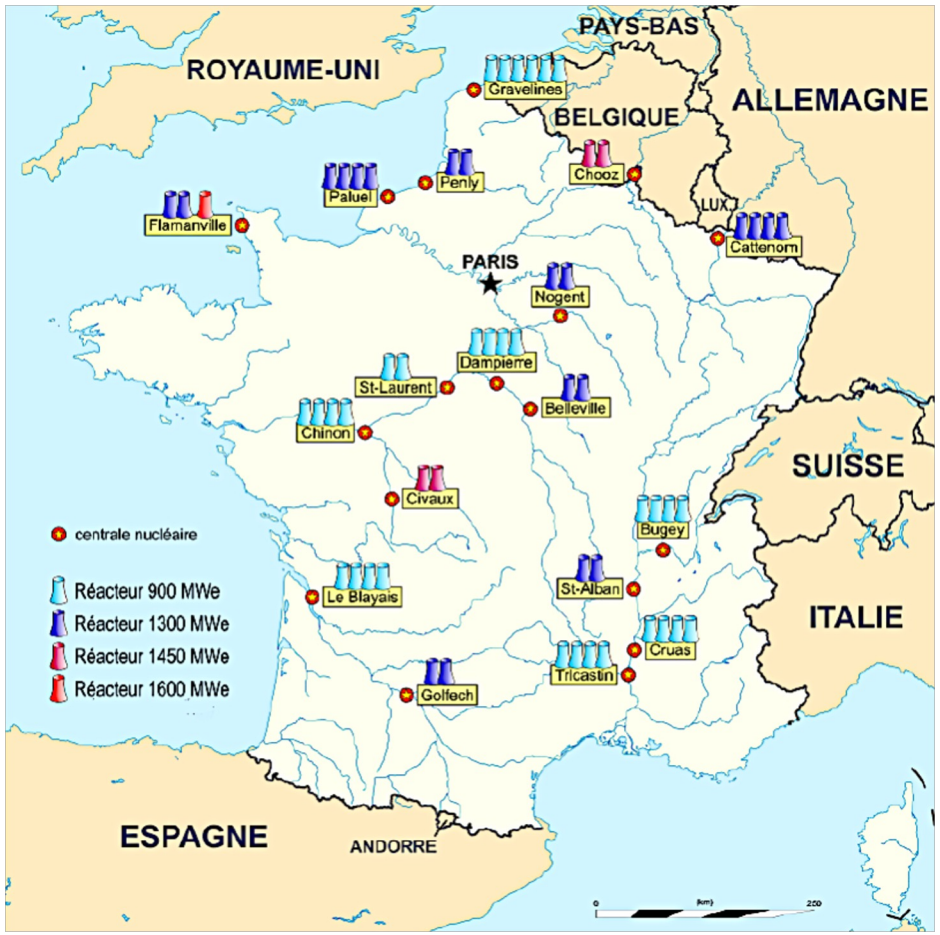


Source : France Primary Energy Production (SDES) 2024 report, Bilan Énergétique de la France

RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

EXPERTISE FRANCE
GROUPE AFD

France current nuclear production sites : the backbone of our energy production



RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

EXPERTISE FRANCE
GROUPE AFD

The Promise of White Hydrogen

White hydrogen: Naturally occurring and carbon-free.

Advantages over traditional hydrogen production methods.

Role in reducing carbon emissions and promoting sustainability.

RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

EXPERTISE FRANCE
GROUPE AFD

World's Largest Hydrogen Reserve

Discovery of 46 million tons of natural hydrogen in Folschviller, Moselle region.

Potential to revolutionize clean energy production.

Highlighting the significance of this find for France's energy future.

RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

EXPERTISE FRANCE
GROUPE AFD

Economic Boost and Environmental Benefits

Economic value currently estimated at $92 billion.

Potential for job creation and local economic stimulation.

Environmental benefits of transitioning to white hydrogen.

RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

EXPERTISE FRANCE
GROUPE AFD

Overcoming Challenges

Challenges in extracting and utilizing white hydrogen.

Need for technological advancements and infrastructure development.

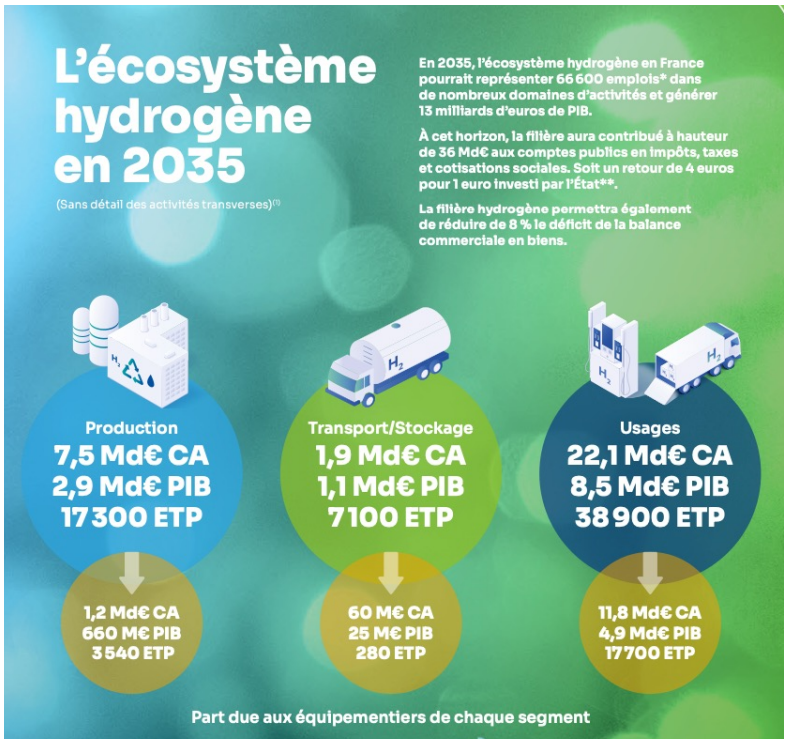
Future prospects and ongoing research efforts.

RÉPUBLIQUE FRANÇAISE
Liberté Égalité Fraternité

EXPERTISE FRANCE
GROUPE AFD

Hydrogen ecosystem and solutions in France

Production	○ Electrolyse ○ A partir de biomasse ○ Reformage du méthane	○ Pyrolyse du Méthane ○ Hydrogène géologique ○ Autres
Liquéfaction	○ Liquéfacteur	
Stockage	○ Forme gazeuse ○ Forme liquide	○ Forme solide ○ Géologique
Transport	○ Voie routière ○ Hydrogénoducs	○ Voie maritime
Molécules de synthèse	○ Méthane	○ L(O)HC
Distribution	○ Stations de recharge	
Usages	○ Piles à combustible ○ Mobilité VL & PL ○ Applications portuaires ○ Aéronautique ○ Ferroviaire	○ Engins spéciaux ○ Usages stationnaires
Composants transverses	○ Instrumentation ○ Alimentation électrique des électrolyseurs ○ Automation (à venir)	



France Hydrogène
Engagée pour la transition écologique

RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

EXPERTISE FRANCE
GROUPE AFD

Highlight on hydrogen ecosystem and solutions in France

Electrolysers manufacturing

SMR and CCS

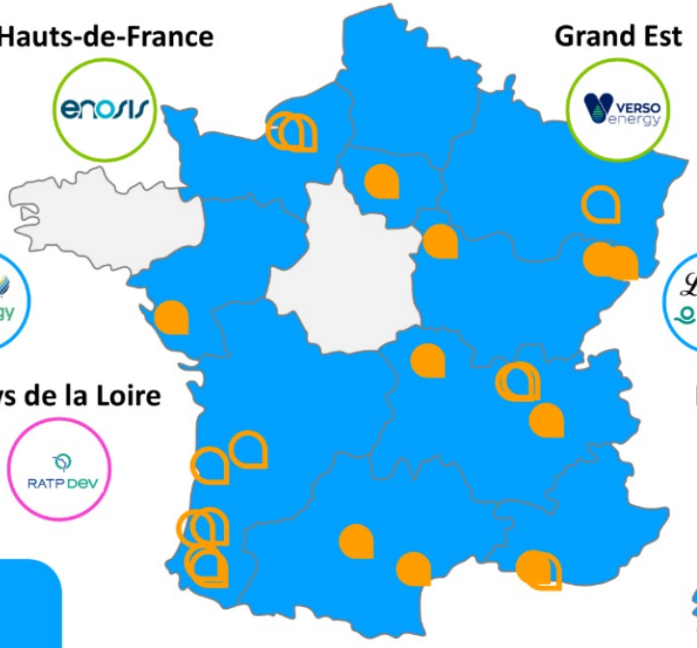
France Hydrogène
Engagée pour la transition écologique

RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

EXPERTISE FRANCE
GROUPE AFD

HYDROGEN IN FRANCE

ADVANCING TOWARDS A NET ZERO FUTURE



Normandie
VERSO energy · inocel

Ile-de-France
EODev

Hauts-de-France
enosis

Grand Est
VERSO energy

Bourgogne-Franche-Comté
Nincatec Energy · Lhyfe · inocel · KEOLIS

Nouvelle Aquitaine
TERÉGA · VERSO energy · Elyse · 45-8 storengy

Auvergne-Rhône-Alpes
Lhyfe · inocel · green corp · SYMBIO · HOPIUM · HOPIUM

Occitanie
Helion by ALSTOM · HRS · Qair · IMING

Pays de la Loire
RATP DEV

Provence-Alpes-Côte d'Azur
GravitHy · sakowin

Corse
Corsica Sole

MARCH 2025

Monthly News & Highlights

Non exhaustive list of news (projects, contracts, investment, partnership, etc.) in France published between the first and the last day of the month

Advanced stage project news: FID, construction, operation ; contract, delivery

Early-stage project news: MoU, FEED, concertation, etc.

Upstream project news
Midstream project news
Downstream project news
R&D&I project news

Unlocatable

HOPIUM · Haffner Energy · AIRBUS · EODev · EVE SYSTEM · green corp · cnrs · MICHELIN · Elyse · ATOBA energy · UIMM · France Hydrogène

RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

EXPERTISE FRANCE
GROUPE AFD

Global Hydrogen Innovation

Importance of international cooperation.

France's potential to lead global energy innovation.

Collaboration in advancing hydrogen technology.

RÉPUBLIQUE FRANÇAISE
Liberté Égalité Fraternité

Global Hydrogen Innovation

EXPERTISE FRANCE
GROUPE AFD

Technology	Energy Source and input	Carbon Footprint (LCA)	Maturity	Advantage	Challenges	Related color
Water Electrolysis	Renewable Electricity and Water	Between 0.4 – 3.0 kg CO2 / kg H2 (Next LCA ENR)	TRL 9	*Attractive price of electrical energy *Attractive price for production by regions with good renewable energy potential	*Intermittent production and impact on CAPEX utilization. *Need for abundant electrical renewable energy source *Hydrogen price depending on the price of electricity	GREEN
Water Electrolysis	Nuclear Electricity and Water	Between 0.4 and 0.8 kg CO2 / kg H2	TRL 9	*High load factor possible due to continuous power supply to electrolysers	*Arbitrage of nuclear power plant production: requires excess capacity	PINK
Water Electrolysis	Electricity from Network and water	Less than 3 kg CO2/kg H2 if mains < 60 g CO2/kWhe (France between 2.4-2.8 kg CO2/kg H2)	TRL 9	*High load factor possible due to continuous power supply to electrolysers	*Hydrogen price directly dependent on the price of electrical energy *carbon footprint dependent on the energy mix	YELLOW
Thermal process: Natural gas steam reforming (SMR/ATR) with CCS unit	Natural Gas	Between 1 and 3 kg CO2 / kg H2 according to LCA analysis (including natural gas origin)	TRL 8-9	*Operators (industrial gases) in place. *Mass production capacity *low LCOE (< 3.5 €/kg)	*Origin and cost of natural gas *requires CO2 saving: capture + transport + storage	BLUE
Thermal process: Steam reforming of gas (SMR/ATR)	Biomethane	Approx. 2.1 kg CO2	TRL 8-9/ TRL5-6	*low carbon footprint *production of biogenic CO2	*production limited by volumes of biomass inputs to produce biomethane *Input collection radius *recovery of co-products (biogenic CO2)	GREEN
Thermal Process: High Temperature Pyrolysis	Natural Gas / Biomethane	Between 1 and 3 kg CO2 / kg H2 according to LCA analysis and Source of electrical energy	TRL 7-8	*No direct CO2 emissions per unit *Co-production of black carbon which is a carbon sink	*origin, cost of electricity and methane *Need to find new outlets for carbon black	TURQUOISE / GREEN
Thermal Process: Thermolysis, Pyrogasification, Others	Biomass	Approx. 2 kg CO2 / kg H2 and 10-12 kg biogenic CO2 / kg H2 CO2 partly neutralized by the production of co-products	TRL 9	*co-production of biogenic CO2 and biochar *low carbon footprint	*production limited by the available volumes of inputs *Input collection radius *Valorisation of co-products	GREEN
Geological process: Drilling boreholes for extraction	No inputs	Not available (low because of low energy consumption)	TRL 5	*Low energy consumption *can be coupled with the valuation of Geothermal and Helium	*Site exploration in progress *Remains to be developed and commercialized at industrial scale	WHITE
Geological process: Injection and recovery wells	Water	Not available (negative impact with sequestration of CO2)	TRL2	*Low energy consumption *Allows CO2 sequestration in parallel with H2 production	Need to move to pilot and then industrial scale to Test the model	ORANGE

Data source : Adapted from Evolen Study on H2 – 2024 (French Energy Supply Chain Association)

RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

EXPERTISE FRANCE
GROUPE AFD

The Future of Hydrogen in France

Summary of key points.

France's potential as a leader in hydrogen energy.

Ongoing research and development efforts.