



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

IPHE Country Update November 2022: FRANCE

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1. New Initiatives, Programs, and Policies on Hydrogen and Fuel Cells

- **Anniversary review and announcements on the France 2030 investment plan.** The French Prime Minister, Elisabeth Borne, took stock of the actions carried out within the framework of France 2030, on the occasion of the anniversary of the investment plan, on November 18th. To achieve the goals set for 2030, through to the €9 billion allocated to the decarbonized hydrogen strategy, 4 strategic points are identified:
 1. deploying electrolyzers connected to the decarbonized electrical grid, close to the places of end-use;
 2. concurrently supporting the industrial equipment sectors and end-uses;
 3. building an industrial sector in France that creates jobs and secures the technological know-how;
 4. promoting the French model of decarbonized hydrogen production.

The government is dedicating €2.1 billion in aid for "10 gigafactories of electrolyzers, hydrogen tanks, fuel cells for hydrogen mobility and transport equipment", as part of the first wave of the Important Projects of Common European Interest (IPCEI). Above all, the press kit indicates that "France is devoting €775 million to support hydrogen ecosystems"; this implies that an envelope of €500 million between now and the end of 2026 seems to be secured for the Hydrogen territorial ecosystems ("Ecosystèmes territoriaux hydrogène") call for projects, operated by the French ecological transition Agency (Ademe). In the aviation sector, the government wants to produce "the first low-carbon aircraft" by 2030 through energy efficiency gains and the transition to low-carbon fuels, "using new energy carriers such as hydrogen. Finally, if the President of the Republic had indeed announced on October 12th, 2021 that the first objective of France 2030 plan was "to bring about the emergence in France, by 2030, of innovative small nuclear reactors, with better waste management," the anniversary press kit specifies the objectives of these new types of reactors. One of them is to "diversify the uses [of nuclear energy], in addition to electricity production," with "heat cogeneration, fresh water production, and the production of low-carbon hydrogen.

- **The joint Franco-German declaration for an European industrial policy.** On November 22nd, the French Minister of Economy and Finance and the German Minister of Economic Affairs and Climate Action issued a joint statement addressing the current high energy prices and the war in Ukraine. The ministers stressed the importance of solidarity and to that end the fact that the European energy interconnections must be operational and strengthened, "notably through the BarMar project". In this context, the two ministers announced that they had decided to "set up a working group to accelerate" Franco-German cooperation on hydrogen, a field in which both countries recognize that they are frontrunners.
- **2022 review and announcements concerning the France 2030 investment plan.** On October 19, Prime Minister Elisabeth Borne presented to the Council of Ministers the results of the first year of the France 2030 investment plan. Out of the 7.5 billion



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euros already committed by the State in the form of subsidies or repayable advances, Elisabeth Borne emphasized that the objective of allocating at least 50% of the credits to projects that reduce greenhouse gas emissions has been achieved, in particular thanks to projects for the development of hydrogen-related technologies.

- **Joint declaration by the French, Spanish and Portuguese heads of state on the construction of a hydro-pipeline in the Mediterranean.** The President of the French Republic, Emmanuel Macron, met with his Spanish and Portuguese counterparts, Pedro Sanchez and Antonio Costa, on October 20th, to discuss the MidCat pipeline project. The three heads of state agreed, among other things, "to abandon the MidCat project and to create, as a priority, a green energy corridor linking Portugal, Spain and France to the EU energy network. This energy corridor would materialize through the "construction of a maritime gas pipeline from Barcelona to Marseille", which would in fact be a hydrogen infrastructure that would "be technically adapted to transport other renewable gases, as well as a limited proportion of natural gas as a temporary and transitory energy source". In the press statement following the meeting, Emmanuel Macron said that the aim is "to work on a hydrogen and renewable energy interconnection between Barcelona and Marseille, which could also be doubled by electrical interconnections" in order to "open up the Iberian Peninsula". The joint declaration announces the next step in the process: a new meeting between the three heads of state on December 9th, "to decide on the timetable, sources of financing and cost issues related to the implementation of the BarMar component of the green energy corridor between Portugal, Spain and France. Energy Commissioner Kadri Simson's spokesperson announced on October 24th that the European Commission is "ready to support" the hydrogen interconnection project between Barcelona and Marseille. While the joint declaration speaks of the possibility of injecting into the pipeline a "limited proportion of natural gas as a temporary and transitional energy source", Kadri Simson's spokesman said the Commission was waiting for technical details and that the EU could no longer finance fossil gas projects (TEN-E regulation).
- **The energy transition of commercial ports.** The Minister of State for Transport, Clément Beaune, and the Secretary of State for the Sea, Hervé Berville, held "a meeting bringing together the main managers of French commercial ports and the elected representatives concerned as part of the strengthening of the national port strategy". The participants identified three major issues, including "the decarbonization of industry in port areas": "the ability to develop ports to accommodate these activities such as floating wind or renewable hydrogen, and therefore the need for associated land was highlighted. The government has indicated that it is working on "proposals to accelerate the transition of ports", which should be presented in the first half of 2023.
- **The Prime Minister's announcements on hydrogen IPCEI.** French Prime Minister Elisabeth Borne announced that the 10 French projects selected in July in the first wave of the Hydrogen Important Project of Common European Interest (IPCEI), Hy2Tech, will receive a total of €2.1 billion in public funding. This aid, from the hydrogen component of the France 2030 investment plan (€9 billion), should mobilize €3.2 billion of private investment and create nearly 5,200 direct jobs in 7 regions. Stressing that French projects are included in the second wave of the IPCEI announced by the European Commission, Elisabeth Borne said that "a dozen French files remain in the running for a third and fourth wave focused on production infrastructure and hydrogen mobility. She added: "We will ensure that these projects benefit from the same support methods. No project will be left out. The Prime Minister also indicated that "the emergence of a sector also requires an appropriate regulatory



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framework", that recognizes the contribution of low-carbon hydrogen in order to reach the GHG emissions reduction objectives.

- **[Adoption of the report on "nuclear energy and low-carbon hydrogen" in the Senate](#)**. On July 20th, the French Senate's Economic Affairs Committee adopted the conclusions of a fact-finding mission on "nuclear energy and low-carbon hydrogen". In particular, the senators recommend that the national objective of deploying 6.5 GW of electrolysis by 2030 be included in the energy-climate programming law (to be adopted before July 1st, 2023).

2. Hydrogen and Fuel Cell R&D Update

- **[The Priority Research Program and Equipment on Decarbonized Hydrogen](#)** (PEPR-H2). The PEPR-H2 purpose is to support upstream R&D activities (TRL 1 to 4) by exploring new avenues that could lead to breakthrough innovations, of interest to the strategy but also in support of the industry. It covers the issues of production, storage, transport of decarbonized hydrogen and its use for heavy-duty mobility. Work is also carried out to support the deployment of hydrogen systems through life cycle analyses, technical and socio-economic studies and safety aspects. The structure of the 8-year program currently includes the DurabilHy Equipex and 17 R&D projects covering the entire value chain of the hydrogen industry. With a budget of €80 million, it will involve more than 150 permanent researchers and will train more than 75 PhD students and 60 post-doctoral students.
- **[Carbone 4 study on low-carbon hydrogen](#)**. The Carbone 4 consulting firm has published a study aimed at identifying "the relevant medium-term uses" of low-carbon hydrogen. This relevance is evaluated on the basis of the "unit decarbonization power" for each of these uses, "and its comparative advantages or disadvantages compared to other decarbonizing options". The study concludes that "low-carbon hydrogen should be prioritized for ammonia production, methanol production, direct iron reduction for steel production". Nevertheless, the report considers that "the use of hydrogen as a flexibility mean for electrical systems will probably be unavoidable, in the medium and especially in the long term, to accompany the development of intermittent electricity production means, such as wind and photovoltaic". Finally, while Carbone 4 considers that the aviation sector will need a long-term supply of low-carbon hydrogen, the firm estimates that "volumes [of synthetic kerosene] will be almost zero" by 2030. Finally, the report concludes that the use of hydrogen for trains and trucks is relevant but "in limited quantities", and that new production of (low-carbon) ammonia should not be undertaken to supply maritime transport, as the technological maturity of ammonia fuel is still considered low and its "decarbonizing intensity lower than for other [synthetic] fuels".
- **[Study on the decarbonization of aviation](#)**. Ademe published a study presenting three scenarios for decarbonizing aviation. While demand management is identified as the most effective lever for decarbonizing the sector, the possibilities for decarbonizing fuel are also discussed. In particular, the Agency points out that "the potential emissions reductions from substituting kerosene with low-carbon electrofuels or hydrogen depend on the carbon intensity of the electricity mix in the country where they are produced" and that, as a result, "the production of electrofuels is not necessarily a relevant decarbonization lever for all flights. The Agency concludes that "hydrogen consumption will remain minor in all scenarios". However, it seems that this only refers to hydrogen used directly, and not to the hydrogen used for the synthesis of kerosene, as the study



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indicates that 8 to 17% of the low-carbon electricity should be allocated to the aviation sector in these scenarios.

3. Demonstration, Deployments, and Workforce Developments Update

- 10 French projects selected in July in the 1st wave of the Important Projects of Common European Interest (IPCEI) on Hydrogen, [Hy2Tech](#)
- 2nd wave of the IPCEI [Hy2Use](#) on Hydrogen. The European Commission has approved the second wave of the IPCEI Hy2Use on hydrogen. €5.2 billion of public aid could be granted to the 35 selected projects - carried by 29 companies and located in 13 Member States. The projects in this second wave focus on the construction of infrastructure "for the production, storage and transport of renewable and low-carbon hydrogen", as well as on "the development of innovative and more sustainable technologies for the integration of hydrogen into industrial processes in several sectors". Two French projects have been selected, led respectively by Air Liquide, and a Total Energies-Engie consortium (MassHylia project).
- [Vinci Airports accelerates on hydrogen](#). Already involved in several projects, Vinci Airports has just formalized the signing of new MoU to study the deployment of hydrogen in airports. Vinci Airports, a subsidiary of Vinci Concessions in charge of developing and operating some 50 airports around the world, has just announced two ground breaking agreements. The first agreement, with Airbus, aims to launch a study on the use of hydrogen at Kansai, Osaka, Itami and Kobe international airports in Japan. On the other side of the world, Vinci Airports has teamed up with a group of energy companies (Air Liquide, Copec and Colbun) to integrate renewable hydrogen into operations at Santiago Airport in Chile.
- **Feedback to help local authorities who wish to deploy hydrogen bus fleets.** In order to provide as much information as possible to local authorities and project leaders interested in the deployment of hydrogen electric buses, "France Hydrogène Mobilité", the group dedicated to road mobility within France Hydrogène association, has published a booklet for the territories: Feedback on the first deployments of hydrogen electric buses in France.
- [Adapting business skills to the specificities of hydrogen](#). Following the "Hydrogen industry skills and professions" reference system, this study published by France Hydrogène refines the understanding of the changes generated by the development of the industry in terms of the evolution of the skills needs of industrial professions. Actions emerge to rapidly adapt the training offer and thus meet the challenge of industrialization and deployment of hydrogen solutions.
- [McPhy, inaugurates its headquarters and hydrogen refilling station plant in Grenoble](#). McPhy has just inaugurated a new site in Grenoble capable of enabling it, in the long term, "to produce 150 hydrogen refilling stations per year".
- [Pragma Mobility's hydrogen-powered light mobility available in leasing for professionals](#). After the inauguration of a new last-mile delivery service using hydrogen-powered cargo bikes, Pragma Mobility is launching a new offer for local authorities and professionals by offering its bikes and three-wheelers for long-term rental. With a purchase price of €5,690 excluding VAT, the two-wheeler offers a range of 150 kilometers and recharges in two minutes. The leasing offer starts at €79 (excl. VAT) per month and an all-inclusive package will be proposed with several options



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(unlimited hydrogen, after-sales service, insurance...). In parallel, Pragma Mobility is also proposing green hydrogen distribution stations through a customized ecosystem deployment study.

- [**GCK launches the first French hydrogen coach.**](#) It is a retrofitted Iveco Crossway model. The design is from Auvergne region, like the engine and the battery. The battery is from Lyon, manufactured by the Symbio group. And the tanks are produced by Forvia (ex-Faurecia). GCK has booked 30 orders and is negotiating 500 additional vehicles.
- [**Stellantis Hordain to assemble a hydrogen-powered commercial vehicle in 2023.**](#) Hordain plant has been assembling electric commercial and passenger vehicles for nearly two years. Since the beginning of the year, a few dozen have been sent to Germany to be converted to hydrogen. Tomorrow, this will be done on the site, in a new workshop.
- [**Crédit Agricole buys 10,000 hydrogen-powered sedans from Hopium to be produced in Normandy.**](#) Credit Agricole Consumer Finance and Hopium "have signed a memorandum of understanding for a provisional order of 10,000 vehicles, with production scheduled to begin in 2025," "Agilauto, the Crédit Agricole Group's specialized automotive sales and financing brand in France, will offer the hydrogen-powered sedan from French manufacturer Hopium as part of programs for its individual and business customers," the statement added. The first non-utility hydrogen vehicle produced in France. Still in the prototype stage, the Hopium Machina is a fuel cell sports sedan. It should be offered at around €120,000 and promises a range of 1,000 kilometers, for a power of 500 HP and a weight under two tons. It would be the first non-utility hydrogen vehicle produced in France. This memorandum of understanding "allows us to strengthen our commercial strategy with a projected order of 1.2 billion euros".
- [**Hydrogen fuel cell: Inocel launches with Mike Horn.**](#) From a sports project to an entrepreneurial adventure. The start-up Inocel has just announced a capital increase of €10 million. The genesis of this company, created in May, began with a collaboration between the adventurer Mike Horn and the CEA in Grenoble. The former wanted to "decarbonize" the Dakar Rally by winning it with a hydrogen car, so he called on the Innovation Laboratory for New Energy Technologies and Nanomaterials (CEA LITEN). The project then branched out to focus on the technology developed: PEMFC. "The cell we are developing is particularly efficient and powerful, which is not usually the case for PEMFCs," says Jules Billiet, Inocel's deputy CEO. Hence the desire to move quickly towards industrialization, even if it means putting the Dakar project on hold. "We are targeting three segments: maritime transport, land transport - such as trucks, construction equipment or excavators - and stationary transport, such as generators," he continues.
- [**Blue Spirit Aero: the new French hydrogen aircraft nugget.**](#) French company Blue Spirit Aero is developing a prototype hydrogen-powered aircraft with multiple engines for flight schools. Blue Spirit Aero (BSA) was founded in 2020 by Oliver Savin, who has worked for more than 25 years on the implementation of hydrogen in various airborne applications. Today, the company is in the midst of two years of flight testing fuel cells on scale radio-controlled models to validate the dynamic performance of the Dragonfly, its future hydrogen aircraft. If all goes according to plan, the first full-scale flight will be tested in 2024, which will mark the beginning of the certification campaign for the European Aviation Safety Agency (EASA) CS-23 regulation.



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- **Peugeot e-expert Hydrogen: an electric utility without compromise.** Peugeot (Stellantis group) is betting on hydrogen to expand its range of electric commercial vehicles. To do this, it is currently developing the Peugeot e-Expert Hydrogen at the Rüsselsheim plant in Germany. A project that is making great strides as European journalists have just tested this new model. An electric van powered by a hydrogen fuel cell. A cutting-edge technology that offers an electric mobility solution without compromise. A solution that benefits from all the advantages of hydrogen, battery technology and electric traction. All this while preserving the same loading volume as that of the diesel and battery electric versions. With the e-Expert Hydrogen, Peugeot is clearly showing its ambitions in terms of hydrogen.
- **Air Liquide and Siemens Energy create a joint venture for the production of electrolyzers.** French industrial gases group Air Liquide and German group Siemens Energy announced the creation of a joint venture dedicated to the mass production in a plant in Berlin of electrolyzers designed to manufacture renewable hydrogen. Production is scheduled to begin in the second half of 2023 "with a ramp-up to an annual capacity of three gigawatts by 2025."
- **World first experiments of a Flettner rotor-propelled energy ship for far-offshore wind energy harvesting.** Farwind Energy designs, develops, commercializes and operates solutions for far-offshore wind energy - a huge energy reservoir currently unexploited - conversion, storage and delivery. These solutions are based on wind-propelled energy ships, that generates electricity and store energy on-board (batteries, H₂ or synthetic fuel). In the case of hydrogen energy storage, Farwind Energy solution is particularly well suited to energy supply of islands and ports, minimizing transport costs. In 2021, the French start-up FARWIND ENERGY tested its 1/14 scale energy ship prototype. The prototype is catamaran propelled by a Flettner rotor. It is equipped with a 240 mm diameter water turbine and a 2.8 m high Flettner rotor. When spinning, it generates lift due to Magnus effect as the wind blows across it. The prototype was remote-controlled. Following this achievement, FARWIND has recently developed the general arrangement and basic design for a full scale energy ship (80 meters long, 30 meters wide, 2.5 MW net power). FARWIND aims at the deployment of a first hydrogen-producing energy ship by 2026 off the coast of the Pays de la Loire and Brittany regions in France, and in the Caribbean islands. This vessel will be able to produce around 5 tons of hydrogen every 5 days, and deliver it to users to the various ports in those areas

4. Events and Sollicitations

- 1-2 February 2023 [HyVolition 2023](#) Paris Porte de Versailles

5. Investments: Government and Collaborative Hydrogen and Fuel Cell Funding

Two open call for projects

1. “[demonstration and technology bricks](#)” with a budget of €350 M for the next three years.
2. “[territorial hydrogen ecosystems](#)” with a budget of €275 M for the next three years.

The third call has been very rich. Of the sixty or so projects submitted, 18 are currently undergoing in-depth analysis. All the projects represent a production capacity equivalent to 51 MW of electrolysis. In terms of distribution and use,



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these projects cover the installation of 38 new hydrogen refilling stations and the deployment of 440 heavy vehicles and several hundred commercial vehicles.

"The amount of aid allocated to each of these projects will depend on the in-depth investigation," states the ADEME press release, which has a total budget of up to €180 million.

6. Regulations, Codes & Standards, and Safety Update

- [**Publication of the decree on the electric TIRUERT**](#). A decree published on October 18th implements the inclusion of renewable electricity in the energies that allow to reduce the amount of the fuel tax paid by fuel distributors, proportional to the use of renewable energy in transport sector (TIRUERT). The decree specifies the conditions and "supporting documents (certificates and follow-up accounting) that must be presented by taxpayers in order to benefit from the tax exemption". In this case, the charging stations must be public to be eligible, and meet certain conditions of counting and metrology. Similar provisions should be included in the expected decree for the implementation of the inclusion of renewable hydrogen, scheduled for January 1, 2023.



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Summary Country Update November 2022: France

Transportation	Target Number	Current Status	Partnerships, Strategic Approach	Support Mechanism
Fuel Cell Vehicles ¹	5,000 by 2023 20 – 50,000 by 2028	589 (Nov 22)	National Implementation Plan based on a cluster model approach	<ul style="list-style-type: none">Subsidy for purchase (national government initiative on electrical vehicle, European projects)
Fuel Cell Bus	200 by 2023 800 - 2,000 by 2028	33 (Nov 22)	33 buses in operation, 106 buses in deployment phase and 409 in plan	<ul style="list-style-type: none">Subsidy for purchase (European project + national and regional funds)
Fuel Cell Trucks ²		1 (Nov 22)	1 Refuse truck in operation, 60 heavy vehicles in deployment, 171 in plan	<ul style="list-style-type: none">Subsidy for purchase (national and regional funds)
Forklifts	No target	322 (Nov 22)	Within European and national projects	<ul style="list-style-type: none">Subsidy for purchase (European project)
FC Bikes	No target	300 (Nov 22)	Within national projects	<ul style="list-style-type: none">Subsidy for purchase (national and regional funds)
H ₂ Refueling Stations	Target Number	Current Status	Partnerships, Strategic Approach	Support Mechanism
70 MPa On-Site Production	100 HRS by 2023 400 - 1,000 by 2028	As of Nov 2022: 6	National Implementation Plan based on a cluster model approach HRS are dual 350/700 bar	<ul style="list-style-type: none">Subsidy for installation and operation (European and national projects)
70 MPa Delivered		As of Nov 2022: 6	National Implementation Plan based on a cluster model approach HRS are dual 350/700 bar	<ul style="list-style-type: none">Subsidy for installation and operation (European and national projects)
35 MPa On-Site Production		As of Nov 2022: 14	National Implementation Plan based on a cluster model approach	<ul style="list-style-type: none">Subsidy for installation and operation (European and national projects)

¹ Includes Fuel Cell Electric Vehicles with Range Extenders

² As above



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35 MPa Delivered		As of Nov 2022: 15	National Implementation Plan based on a cluster model approach	Subsidy for installation and operation (European and national projects)
20/30 MPa On-Site Production		As of Nov 2022: 6	HRS for bikes	
20/30 MPa Delivered		As of Nov 2022: 3	HRS for bikes	
Stationary	Target Number ³	Current Status	Partnerships, Strategic Approach	Support Mechanism
Small ⁴	No target	112 (April 20)	European (Ene.field 35, PACE 66) and national (ADEME & GRDF) funded projects for residential and small tertiary 1 system r-SOC in demonstration	• Subsidy for purchase (European and national projects)
Medium ⁵	No target	37 (Nov 22)	For a total of 2400 kW in operation	
Large ⁶	No target			
District Grid ⁷	No target			
Regional Grid ⁸	No target			
Telecom backup	No target			

³ Targets can be units installed and/or total installed capacity in the size range indicated

⁴ <5 kW (e.g., Residential Use)

⁵ 5kW – 400 kW (e.g., Distributed Residential Use)

⁶ 0.3MW – 10 MW (e.g., Industrial Use)

⁷ 1MW – 30 MW (e.g., Grid Stability, Ancillary Services)

⁸ 30MW plus (e.g., Grid Storage and Systems Management)



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H ₂ Production	Target ⁹	Current Status	Partnerships, Strategic Approach	Support Mechanism
Fossil Fuels ¹⁰	No target	420 kt (2019)	•	
Water Electrolysis ¹¹ (PEM, Alkaline, SOEC)	6.5 GW by 2030	13 MW (As of Nov 2022)	French national strategy	Subsidy for installation and operation (European and national projects)
By-product H ₂	No target	360 kt (2019)		
Energy Storage from Renewables	Target ¹²	Current Status	Partnership, Strategic Approach	Support Mechanism
Inst. Electrolyser Capacity	6.5 GW by 2030	13 MW (As of Nov 2022)	French national strategy	Subsidy for installation and operation (European and national projects)
Power to Power ¹³ Capacity	No target	100 kW	Myrte platform in Corsica	Subsidy for installation and operation (European and national projects)
Power to Gas ¹⁴ Capacity	No target	1 MW	<ul style="list-style-type: none">• Jupiter 1000 project (1 MWe of electrolysis)• GHRYD: 20% hydrogen in a local gas distribution network• MethyCentre	Subsidy for installation and operation (European and national projects)

⁹ Target can be by quantity (Nm³, kg, t) and by percentage of total production; also, reference to efficiency capabilities can be a target

¹⁰ Hydrogen produced by reforming processes

¹¹ Please indicate if targets relate to a specific technology (PEM, Alkaline, SOEC)

¹² Can be expressed in MW of Installed Capacity to use the electricity from renewable energy generation, and Annual MWh of stored energy capacity

¹³ Operator has an obligation to return the electricity stored through the use of hydrogen back to electricity

¹⁴ Operator has the opportunity to provide the stored energy in the form of hydrogen back to the energy system through multiple channels (e.g., merchant product, enriched natural gas, synthetic methane for transportation, heating, electricity)