



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

IPHE Country Update April 2019: FRANCE

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

- **Publication of the Multi Annual Energy Programme project (Programmation pluriannuelle de l'énergie - PPE):**

The Energy Transition Law for Green Growth created these programmes as tools for steering the French energy policy. They concern the continental metropolis and the so-called non-interconnected areas (ZNI), namely Corsica, Reunion, Guyana, Martinique, Guadeloupe, Wallis and Futuna, and Saint-Pierre and Miquelon. The government developed the Continental Metropolitan PPE while the ZNI PPEs are co-elaborated with local authorities. The PPE's define the priorities and actions of the public authorities for the management of energy networks over the period 2019-2023 and 2024-2028.

Article 5 defines two categories of hydrogen objectives:

- i. in accordance with the Hydrogen Deployment Plan, **targets of 10% hydrogen decarbonised in industrial hydrogen by the end of 2023 and 20% to 40% by the end of 2028;**
- ii. **targets for the deployment of power demonstrators to gas fixed between 1 to 10 by 2023 and 10 to 100 by 2028.**

Article 6 includes the objectives for deploying hydrogen charging infrastructures, defined as 100 by 2023 and in a range of 400 to 1000 by 2028. France also wishes to engage with its main neighbours to increase integration of European energy systems: Belgium, Luxembourg, Italy, Spain, the United Kingdom, Ireland, the Netherlands and Portugal. This PPE project is one of the components of the draft Integrated National Climate Energy Plan which is a European obligation. <https://www.ecologique-solidaire.gouv.fr/programmations-pluriannuelles-lenergie-ppe>

- **The Parliamentary Office for the Assessment of Science and Technology Options (OPECST):**

OPECST adopted its [scientific report on electricity storage](http://www2.assemblee-nationale.fr/content/download/75684/776790/version/2/file/note_stockage_electricite.pdf), carried out at the initiative of Senator Angèle Prévaille (PS, Lot). Covering STEPs, batteries and hydrogen, the note presents the “technically feasible” advantage of hydrogen in this area but also raises “economic barriers in the near future” (competitiveness and investment). http://www2.assemblee-nationale.fr/content/download/75684/776790/version/2/file/note_stockage_electricite.pdf

Also, OPECST adopted a [report on technological scenarios](#) to achieve the objective of stopping the commercialization of internal combustion vehicles by 2040. Elaborated under the aegis of Senator Stéphane Piednoir (LR, Maine-et-Loire) and MP Huguette Tiegna (LREM, Lot) with the support of CEA and IFPEN. The report identifies three scenarios based on the



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speed of technical advances and cost decreases in the technologies studied: a pro-hydrogen scenario, a pro-battery scenario, and a median scenario. Two conditions must be met to follow the pro-hydrogen scenario:

“much faster-than-expected technical advancements allowing for accelerated price reductions, and strong public support, with subsidies for the purchase of vehicles being considered up to €10,000 until 2040”.

Formulating recommendations to accompany the exit of the internal combustion vehicle, the rapporteurs advocate in particular the principle of **technological neutrality** by the public authorities, invite to ensure the deployment of infrastructures, encourage professionals to use hydrogen and LNG technologies.

<http://www2.assemblee-nationale.fr/content/download/78251/801167/version/3/file/RAPPORT+CAP+2040.pdf>

- **Statements by the French President on hydrogen during the National Grand Debate**

On 7 March, the President of Durance Luberon Verdon Agglomeration and Mayor of Manosque, Bernard Jeanmet-Péralta questioned President Macron on the Hygreen project: *“I am fighting to achieve the production of hydrogen... The investment amounts to 1 billion euros and the economic spinoffs for our territory between 12 and 14 million euros a year. Do you subscribe to hydrogen production and if so, can you give instructions to the Prefect, the Region and the Department to accompany us in this project?”* The President Macron replied in support of the project: *“I believe in the hydrogen industry. Hydrogen works well on some forms of mobility, including public transport”.*

<https://www.laprovence.com/article/politique/5407478/manosque-emmanuel-macron-soutient-le-projet-hygreen.html>

- **The French Parliament**

On March 15th, Parliament created a **Hydrogen Study Group**, chaired by the Deputies Michel Delpont (REM, Dordogne, Economic Affairs Committee) and Gerard Manuel (LR, Aube, Sustainable Development Committee). Michel Delpont indicated that he intends to bring together some forty Deputies in this Study Group, to meet with experts and support the development of the sector in particular in the automotive industry.

http://www2.assemblee-nationale.fr/instances/fiche/OMC_PO763249

2. Hydrogen and Fuel Cell R&D Update

- **[Franco-German manifesto for a European industrial policy](#) adapted to the 21st century**

Extracts from the manifesto of 19 February between Ministers Lemaire and Altmaier: *“Ensuring that we are able to produce disruptive technologies requires the development of technologies in Europe, from research to first industrial deployment. That is what we’re doing with the very first IPCEI on microelectronics. And now we intend to create a second IPCEI for a new generation of batteries. France and Germany reiterated their objective of identifying credible consortia including automakers in order to take a decision before the end of the first quarter 2019. There are many other areas in which such European cooperation will be essential and which can be envisaged, for example hydrogen, low carbon industrial processes, smart health or cybersecurity.”*

<https://www.tresor.economie.gouv.fr/Articles/2019/02/19/manifeste-franco-allemand-pour-l-industrie>



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3. Demonstration, Deployments, and Workforce Developments Update

- ***Faurecia and Michelin to create a global leader in hydrogen mobility***

Michelin, world leader in tires and sustainable mobility, and Faurecia, technology leader in the automotive industry, announced the signing of a Memorandum of Understanding to create a joint venture bringing together all of Michelin's fuel cell related activities - including its subsidiary Symbio – with those of Faurecia. Michelin and Faurecia will equally own SYMBIO. This French joint venture, built around a unique ecosystem, will develop, produce and market hydrogen fuel cell systems for light vehicles, utility vehicles, trucks and other applications.

Michelin's contribution to this joint venture will be the activities of Symbio - a Group subsidiary since 1 February 2019 and a supplier of hydrogen fuel cell systems associated with a range of digital services - as well as research & development and production activities. Faurecia will contribute the technological fuel cell expertise it has developed through a strategic partnership with the CEA, its industrial expertise and its strategic relationships with car manufacturers.

Faurecia will continue its development of high-pressure hydrogen tanks in partnership with Stelia Aerospace Composites, which will also benefit the joint venture. Michelin and Faurecia signed the agreement in the presence of Agnès Pannier-Runacher, Secretary of State at the French Ministry for Economy and Finance. This operation is subject to the approval of the competent merger authorities. <https://www.faurecia.com/en/newsroom/faurecia-and-michelin-create-global-leader-hydrogen-mobility>

- ***ENGIE and YARA take green hydrogen into the factory***

The two companies are joining forces in Australia to prove that the time to apply green hydrogen technology to industry is now. ENGIE and YARA, one of the world's leading crop nutrition companies, agreed on 5 February to carry out a feasibility study with the goal of designing a green hydrogen plant that would be integrated with YARA's existing ammonia plant in Pilbara, Western Australia. Ammonia is a key ingredient in fertilizers. The goal is to transform the plant from one that relies completely on natural gas for hydrogen to one where a significant share of the hydrogen comes from renewable power.

<https://www.engie.com/en/news/yara-green-hydrogen-factory/>

- ***Air Liquide makes a strategic investment in the production of decarbonized hydrogen by electrolysis***

Air Liquide acquired an 18.6% stake in the Canadian company Hydrogenics Corporation. This strategic transaction, which represents an investment of US\$20.5Million (€18Million), enables the Group to reaffirm its long-term commitment to the hydrogen energy markets and its ambition to be a major player in the supply of carbon-free hydrogen, particularly for industry and mobility markets.

<https://en.media.airliquide.com/news/air-liquide-makes-a-strategic-investment-in-the-production-of-decarbonized-hydrogen-by-electrolysis-b325-56033.html>

- ***SEED-ENERGY supports cities in H2 deployment***

The French start-up Seed-Energy has developed a modelling-simulation software for the economic feasibility of a hydrogen charging station. The goal is to help French municipalities



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in the deployment of energy. The software developed by the start-up, called Odyssey, supports municipalities in their decision-making:

“Odyssey is a dynamic modelling and simulation software that meets the needs of energy stakeholders to assess the technical feasibility, economic profitability and environmental gains of their investment decisions.”

Used since 2017 at CEA, Seed-Energy’s software is making a breakthrough in the municipalities. As part of the recent call for H2-mobility projects, Ademe Agency calls for an economic analysis of the entire hydrogen chain, from the production phase to use. The aim is to be able to assess the costs, the cost-effectiveness of a charging station, the investment needs and ultimately the creation of a business plan.

<https://www.lesechos.fr/thema/0600641179092-seed-energy-accompagne-les-villes-grace-a-odyssey-2244199.php>

• More and more French Regions are active in hydrogen technologies

Region Grand Est

The DINAMHySE project, funded under the "Be Est Filières d'Avenir" call for projects "Grand Plan d'Investissement" aims to boost and accelerate the development of a hydrogen industrial sector in the Grand Est and to implement hydrogen as part of the energy transition.

DINAMHySE will implement the following missions:

- i. to inform and guide with the dissemination of information on the developments, actors and opportunities of hydrogen - energy;
- ii. to structure and facilitate exchanges with the creation of a "Grand Est Hydrogen Club"
- iii. to support and enhance R&D projects, deployment projects, ensuring research services and defining new training modules.

Finally, making the "Grand Est" hydrogen industry visible at national and European level.

Outcomes expected are:

- 10 HRS with locally produced decarbonized H2 by 2023, 40 to 100 by 2028.
- 500 light commercial vehicles and 20 heavy-duty vehicles (buses, trucks, boats) by 2023, 2000 to 5000 and 80 to 200 by 2028.
- Production of 9,000 tons of decarbonized hydrogen by 2023, 18 kt to 36 kt by 2028

Region Normandie

Less than four months after the adoption of the «Plan Normandie Hydrogène», the Region gathered about 100 players from the territory involved in the field of renewable energies and the preservation of the environment (communities, businesses, associations, etc.) to complete a milestone on the implementation of the Plan. Of the 46 actions to be undertaken in the territory under a timetable between 2 and 5 years, some 20 have already been committed.

Some of these projects include:

- i. The DEPLHY VDS (Deployment of Hydrogen in the Seine Valley) project, led by Normandie Energies and financed by the Region Vallée de Seine, which aims to study for 24 months the development potential of hydrogen in an industrial environment along the Seine valley.
- ii. The research project RAPHYD, which brings together several scientific partners: CORIA – LSC – LSPC – CERTAM Chemicals, related to the use of hydrogen as an energy carrier, with a view to developing and deploying new solutions with high



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efficiency and low environmental impact at all stages of the energy chain, from production to use as fuel.

- iii. The ARTEMIS project, carried out by the universities of Caen, Rouen and Le Havre, which will work on issues of acceptability of hydrogen projects by citizens by developing a hybrid reflection science (energy – hydrogen); and study human and social sciences (social acceptability and support).

In addition to the amounts already committed before the preparation and adoption of the Normandy Hydrogen Plan (more than €5Million for projects such as EAS-HyMob or ROAD), the Region will devote €15Million over the next 5 years. <https://hydrogentoday.info/news/4929>

4. Events and Solicitations

- 32nd International Electric Vehicle Symposium, May 19-22, 2019 Lyon (<https://evs32-france.com/about-evs-32/edito>)

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

- Launch of **3 calls for proposals** by ADEME agency following the French Plan of deployment of hydrogen for the energy transition (€100Million):
 - H₂ mobility: mobility ecosystems in link with the measures 8, 9, 10 and 12. Call closed with 24 projects under evaluation
 - **H₂ in industries in link with the measures 1 and 12 opened 25/02/2019 and closed 18/06/2019.**
 - H₂ in isolated zones in link with the measures 4, 6 and 12 in early 2019

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6. Regulations, Codes & Standards, and Safety Update

- Nothing new to report



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Transportation	Target Number	Current Status	Partnerships, Strategic Approach	Support Mechanism
Fuel Cell Vehicles ¹	5,000 by 2023 20,000 – 50,000 by 2028	324 (Oct 2018)	National Implementation Plan based on a cluster model approach	Subsidy for purchase (national government initiative on electrical vehicle, European projects)
FC Bus	200 by 2023	0	European projects 3E Motion + Jive 2 with a total of 31 Buses by 2019	Subsidy for purchase (European project + regional funds)
Fuel Cell Trucks ²	800 - 2,000 by 2028	1	Partnership La Poste, Renault Trucks and Symbio	
Forklifts	No target	~180	Within European and national projects	Subsidy for purchase (European project)
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 November 2018: 0	National Implementation Plan based on a cluster model approach	Subsidy for installation and operation (European and national projects)
70 MPa Delivered		As of November 2018: 3	National Implementation Plan based on a cluster model approach 2 HRS are dual 350/700 bar	Subsidy for installation and operation (European and national projects)
35 MPa On-Site Production		As of November 2018: 4	National Implementation Plan based on a cluster model approach	Subsidy for installation and operation (European and national projects)
35 MPa Delivered		As of November 2018: 14	National Implementation Plan based on a cluster model approach	Subsidy for installation and operation (European and national projects)

¹ Includes Fuel Cell Electric Vehicles with Range Extenders. Objective fixed by the Energy Storage Plan from the “New French Industry”

² As above



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			2 HRS are dual 350/700 bar	
20 MPa On-Site Production		As of November 2018: 2		
20 MPa Delivered		As of November 2018: 2		
Stationary	Target Number ³	Current Status	Partnerships, Strategic Approach	Support Mechanism
Small ⁴	No target	110	European (Ene.field, PACE) and national (ADEME & GRDF) funded projects for residential and small tertiary	Subsidy for purchase (European and national projects)
Medium ⁵	No target	1	GRDF & Air Liquide	
Large ⁶	No target			
District Grid ⁷				
Regional Grid ⁸				
Telecom backup				
H ₂ Production	Target ⁹	Current Status	Partnerships, Strategic Approach	Support Mechanism

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)

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



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Fossil Fuels ¹⁰	10% of decarbonised H2 (ca. 100 000 tonnes) used in the industry by 2023 and 20-40% by 2028			
Water Electrolysis ¹¹ (PEM, Alkaline, SOEC)				
By-product H ₂				
Energy Storage from Renewables	Target¹²	Current Status	Partnership, Strategic Approach	Support Mechanism
Power to Power ¹³ Capacity	No target	100 kWe	Myrte platform in Corsica connected to the grid	
Power to Gas ¹⁴ Capacity	No target		<ul style="list-style-type: none"> • Jupiter 1000 project aiming at 1 MWe by 2018 • GHRYD: 20% hydrogen in a local gas distribution network 	

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)