



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

IPHE Country Update November 2018: France

Name	Laurent Antoni
Contact Information	laurent.antoni@cea.fr , +33 4 38 78 60 25
Covered Period	May – November 2018

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

- Presentation of the **Plan of deployment of hydrogen for the energy transition** by the Minister of the energy transition Nicolas Hulot (01 June). It was developed based on the report by CEA and Direction générale de l'énergie et du climat, at the request of the Minister. This plan profits from an initial envelope of 100 million euros in 2019. It is organized around 3 main axis:
 - To create a decarbonized industrial sector,
 - To develop storage capacities of renewable energies,
 - To develop zero emission solutions for transports

(https://www.ecologique-solidaire.gouv.fr/sites/default/files/Plan_deploiement_hydrogene.pdf)
- In his speech to Congress (French senators and deputies) 09 July, President MACRON announced need for “an ambitious sector policy” by concentrating the action of the State in key sectors to “reduce air pollution and to adapt the mobility and the energy production to our contemporary requirements”. Emmanuel Macron noted “economic opportunities to develop industries like the circular economy or hydrogen, the choices which our society must take now and which should be accompanied”
- Submission of the report of Deputy Benoit SIMIAN on the “**greening**” of the **French rail trains**. The report proposes that the State concentrates on hydrogen. It is important to advance this technology quickly, first by railway achievements thereby making it possible to better understand the potential of hydrogen. Indeed, while the technical and economic obstacles are significant, the advantages appear very large:
 - no local pollution,
 - possibility of mutualisation of the refilling station with other modes of transport (bus, cars, heavyweights, etc),
 - only green solution for the long distances,
 - the vector of energy most interesting in the long term for the storage of electricity.State Secretary for transport Elisabeth Borne indicated: “the Government carries the conviction that hydrogen energy will be a vector impossible to circumvent to make a success of this energy transition.” Seven French regions have already declared an interest in launching a hydrogen train. (https://www.ecologique-solidaire.gouv.fr/sites/default/files/2018-11-22_rapport_final_sur_le_verdissement_de_la_flotte_ferroviaire.pdf)
- On 12 July 2018, the German Minister for the Economy, Peter ALTMAYER, and French Minister of Energy Nicolas Hulot adopted a joint statement on **French-German co-operation in the field of the energy transition**. Indeed, they wish that the two countries co-ordinate



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

elements of their energy strategy within the framework of their national plan energy-climate. This co-operation will be supplemented by concrete measures including reinforcement of the co-operation on hydrogen within the framework proposed by the European Commission (SET Plan and FCH JU), in particular a search for synergies in the respective roadmaps of the deployment of hydrogen, “in order to facilitate a possible industrial cooperation”.(

https://www.ecologique-solidaire.gouv.fr/sites/default/files/2018.07.12%20Renc.%20P.%20ALTMAIER_Mins_Allemand_%C3%A9conomie_%C3%A9nergie.pdf)

- Grand Paris: **installation of a low emission zone** (12 November 2018). The elected officials of Grand Paris voted for the installation of a low-emission zone (ZFE) (<https://www.metropolegrandparis.fr/fr/zone-faibles-emissions-metropolitaine-190>) inside the “Parisian super-peripheral”. This installation will be done in stages:
 - July 2019: prohibition of the diesel vehicles of before 2001 (Crit' Air 5),
 - 2024: prohibition of all the diesel vehicles diesel, and
 - 2030: prohibition of any thermal vehicle.
- On 23 October 2018, the deputies adopted a government amendment to come into effect January 1st, 2019, to implement: a **lowering of the threshold of application of the malus (penalty) to 117 gCO₂/km**; a progressive malus scale for the vehicles emitting from 117 gCO₂/km to 190 gCO₂/km; a levelling off of the malus with 10,500 € for the vehicles emitting 191 gCO₂/km or more.

2. Hydrogen and Fuel Cell R&D Update

French-German workshop on hydrogen under the auspices of Horizon Europe (22 October, 2018 in Paris). With this joint conference on hydrogen, Ministry of Higher Education, Research and Innovation (MESRI) (Ministère de l'enseignement supérieur, de la recherche et de l'innovation) and the German Federal Ministry of Education and Research (BMBF) (Bundesministerium für Bildung und Forschung) wanted to boost hydrogen-related energy research on the European level. Also, they looked to foster mutual understanding between French and German scientific as well as economic stakeholders, to explore the possibilities of cooperation and joint research efforts, to show the potential of research capacities in both countries, and to highlight the technological, economical and regulative challenges of sustainable hydrogen and the low-carbon solutions based on this.

3. Demonstration, Deployments, and Workforce Developments Update

SNCF: hydrogen trains in France by 2022 with end of diesel trains by 2035

In the summer of 2019, SNCF is expected to order the first prototypes of hydrogen trains to start at the beginning of 2022 in France. SNCF will be testing the hybrid propulsion (battery+diesel) in parallel. The aim is to eliminate diesel powered trains by 2035 said M. Guillaume Pepy, CEO of SNCF on November 19 (<https://www.bfmtv.com/economie/sncf-des-trains-a-hydrogene-en-2022pour-arreter-le-diesel-1569620.html>).

100 fuel cell taxis in Paris

The hydrogen-powered taxi fleet "Hype", launched at the end of 2015 by French start-up STEP (Société du Taxi Electrique Parisien) in partnership with Air Liquide, has reached the 100-taxi landmark thanks to a new delivery of cars by Toyota. This delivery is a new stage in the deployment of the world's first hydrogen-powered taxi fleet, which will boast 600



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

vehicles by the end of 2020. The deliveries of the network of hydrogen refilling stations are part of the ZEFER project, thanks to which Hype is accelerating its development in Paris and which has received funding from the Public Private Partnership on Fuel Cells and Hydrogen 2 Joint Undertaking (FCH 2 JU). (<https://energies.airliquide.com/parisian-hydrogen-powered-taxi-fleet-hype-reaches-100-vehicles>).

McPhy installs its 15th hydrogen refilling station

On 15 November, McPHY, a specialist in hydrogen production, storage and distribution equipment, announced that it is to install its 15th hydrogen station for the Communauté de Communes Touraine Vallée de l'Indre in Sorigny (<https://mcphy.com/en/press-releases/15th-hrs-for-mcphy/>). The station has the capacity to deliver 20kg of hydrogen per day, able to charge more than a dozen utility vehicles. McPhy is also present in the very high capacity (several hundred kilos of hydrogen per day) stations market for fueling large fleets of vehicles, buses and even hydrogen-propelled trains, with the first contract for a hydrogen bus station signed in May in the Hauts de France region. In early July, McPhy announced that it has completed the €16 million capital increase reserved for EDF Nouveaux Business Holding under their industrial and commercial partnership. (https://mcphy-mcphy-com.osu.eu-west-2.outscale.com/uploads/2018/07/McPhy_EDF_Reserved_Capital_Increase_02072018_VF_UK.pdf)

Hydrogen Ship “ENERGY OBSERVER”, Chapter 2: Tour of the Mediterranean 2018

Energy Observer is a ship that aims at energy autonomy without greenhouse gas emission, thanks to an embedded hydrogen production/storage/conversion. Energy Observer and CEA developed the ship in Saint-Malo with the support of Accor Group, Thelem Insurance, Delanchy Group and Engie. While its French tour in 2017 mainly utilized the technologies for coastal sailing, the Mediterranean tour in 2018 gave the crew a chance to evaluate the vessel over longer periods at sea (up to 6 days in total energy self-sufficiency). The ship has operated under very high temperatures, exceeding 40°C, and to date has covered more than 10 500 nautical miles, visited 14 countries all by using hydrogen produced from seawater. <http://www.energy-observer.org/>

Hydrogen racing at Le Mans in 2024!

The Automobile Club de l'Ouest (ACO) has always led the way, testing and developing technologies on the racetrack before they are applied to road-going vehicles. Its latest focus is hydrogen, which will be promoted in a special class to be introduced in 2024. A world first. ACO, in collaboration with Green GT, has officially launched Mission H24 at Spa Francorchamps, the setting for the fifth round of the 2018 ELMS (European Le Mans Series) on 9 September 2018 with the new H2 race car and demonstration runs (<https://www.lemans.org/en/news/hydrogen-racing-at-le-mans-in-2024/49576>). Drive the car at https://youtu.be/SOT_vPPCxYw !

4. Events and Solicitations

- European energy transition conference, January 22-24, 2019, Dunkerque (<https://www.assises-energie.net/en/>)
- 8th International Conference on "Fundamentals & Development of Fuel Cells FDFC2019, February 12-14, 2019, Nantes (<https://fdfc2019.sciencesconf.org/>)
- Be positive events, February 13-15, 2019, Lyon (<https://www.bepositive-events.com/en>)



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

- 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 (100 M€):
 - H₂ mobility: mobility ecosystems linked with the measures 8, 9, 10 and 12 opened on 10 October 2018
 - H₂ in industries linked to the measures 1 and 12 opened in early 2019
 - H₂ in isolated zones linked to the measures 4, 6 and 12 in early 2019
- Franco- German joint call for proposals on “sustainable energy” within the framework of the collaboration between the French Ministry of Higher Education, Research and Innovation (MESRI) and the German Federal Ministry of Education and Research (BMBF). Open jointly by the Agence Nationale de la Recherche (ANR), on behalf of MESRI, and BMBF (https://www.ptj.de/lw_resource/datapool/systemfiles/cbox/4190/live/lw_bekdoc/franco-german-joint-call-for-proposals-on-sustainable-energy.pdf).

6. Regulations, Codes & Standards, and Safety Update

- **Hydrogen Refilling Stations: Ministerial ruling** (22 October 2018) related to the general regulations applicable to the classified installations for environmental protection subjected to declaration under the topic n° 1416 (hydrogen refilling stations) of the nomenclature of the classified installations and modifying the decree of November 26th, 2015 relating to the general regulations applicable to the installations implementing the hydrogen gas in an installation classified for environmental protection to feed industrial trucks when the quantity of hydrogen present within the establishment concerns the mode of the declaration for the topic n° 4715 and modifying the decree of August 4th, 2014 relating to the general regulations applicable to the installations classified for environmental protection subjected to declaration under the topic n° 4802. (<https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000037519292&dateTexte=&categorieLien=id>)
- **Hydrogen Law Project** concerning the removal of legal barriers to the deployment of fuel cells and hydrogen applications. Two main objectives:
 - i. Identify regulatory barriers (and best practices) and advocate for better regulation to support the uptake of fuel cell and hydrogen technologies,
 - ii. Document legal and administrative processes which apply when deploying key Hydrogen technologies (coherent, user friendly, online database). (<https://www.hylaw.eu/database>) – France.
- Release of a **guide to deploy hydrogen refilling stations** in French territories. (<http://www.afhypac.org/documents/divers/GUIDE-STATION-HYDROGENE-WEB.pdf>)



Summary Country Update November 2018: France

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



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

			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



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

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 • GHRYP: 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)