Summary of the first Franco-German Conference on Hydrogen
22nd of October 2018

Franco-German cooperation in R&I:

2018 is the year of the 55th anniversary of the Elysée Treaty and the importance of the Franco-German partnership which is the driver of the European integration, has been reminded.

Technological leadership is crucial and increasingly linked to security matters, defense of Western values and socio-political concepts. Europe needs its technological sovereignty in order to ensure that value and business models of others are not imposed on our way of life.

To compete in the international innovation race, the Franco-German tandem has always been the nucleus of European cooperation in R&D.

In the Framework of the Franco-German Research Forum, and considering the importance of research policy cooperation between France and Germany at bilateral, multilateral and European level, BMBF and MESRI organized different meetings and workshops as first steps towards a comprehensive dialogue and agenda process in the field of sustainability which both sides consider to be of priority importance.

Climate protection and Energy transition:

A key topic is R&I for climate protection. Energy transition needs not only renewables energy deployment but also energy supply re-thinking, including industry, heating & cooling and mobility aspects. Energy Union is among the central European projects for the coming decades.

It is difficult to anticipate and plan the entire scope of energy transition, which is a long-term project. Numerous factors are beyond our control. We must be flexible and prepared for varied developments. But the transition to renewable energy will be successful, only if we take an integrated view of energy supply for transport, industry and private households. Cross-sector, systemic solutions are absolutely essential.

Hydrogen can be a key component of the Energy transition and sector coupling:

Green Hydrogen has a key role in the interplay between all components. Its flexibility makes it the ideal candidate for linking different forms of energy, processes and sectors. Hydrogen can be used to store the surplus of electricity production from intermittent renewable energies, make cleaner the industrial processes and the heating and cooling of buildings, go to a cleaner mobility : to fuel not only cars but also heavy vehicles like trucks, trains and boats, to reduce carbon footprint of air transport, to valorize captured CO_2…

Different initiatives are therefore taken at a global and European level and some of them very recently = Hydrogen Council, Mission innovation challenge, Linz Hydrogen Initiative, FCH2 Joint Undertaking…

Testimony of Japan:

The Minister of the Embassy of Japan in France presented how Hydrogen could contribute to the Japan's strategy for Energy transition names 3"E"+Safety : Hydrogen will contribute to decarbonization (Environment), mitigate dependence on specific countries (Energy security), enable to utilize low cost feedstocks (Economic affordability). The "Basic Hydrogen strategy" has been presented by the Prime Minister Abe and aim at making Japan the first Hydrogen Society. Decarbonization is envisioned for 2050. There are fuel cell household systems and vehicles, but further technology development and international cooperation is needed.

Europe should take the lead on this competitive field of Hydrogen technologies:

Creating the supply chain for hydrogen ensuring European growth and jobs is of crucial importance.

French and German national plans for Hydrogen are currently running:

The French National Plan for Hydrogen has been published in June 2018 and focuses on 3 main markets : 1) Industrial low-carbon Hydrogen (targets 10% of low-carbon H_2 in industry in 2023 ; 20 to 40% in 2028) ; 2) clean mobility through the development of captive fleets and heavy vehicles which are key for the business models of charging stations (targets of 5 000 light vehicles and 200 heavy vehicles and 100 charging station in 2023 ; 20 000 to 50 000 light commercial vehicles and 800 to 2 000 heavy vehicles and 400 to 1 000 charging stations in 2028) ; 3) flexibility for the powergrids and decarbonation of the gas grids.

HySPaC is a structuring French academic research network from CNRS started in 2001 and gathers 250 researchers with skills on materials, characterization, electrochemistry, mechanical and thermal performance, modelisation…, working on 4 main topics : Low and High temperature Fuel Cell and electrolysis ; Hydrogen production (not by electrolysis) ; storage, Fuel cell and electrolysis systems. HySPàC has helped to develop research at the interface between different disciplines and to encourage exchanges and collaborations between researchers and generate innovations. HySPaC aims also to catalyze scientific and technological ideas, from academic (TRL 1-2) to applied (TRL3) research, up to industrial transfer (TRL8). This has notably resulted in the creation of startups (McPhy Energy, Mahytec, Sylfen, H2SYS, etc.), whose growth is very important.

The German National innovation programme (NIP) Hydrogen & Fuel Cell technology has been launched in 2006 and ran its first phase to 2016 with 710 M€ ; the second phase began in 2016 and will run to 2026 and includes 250 M€ of funds for measures of research, development and innovation [constantly open for submission with funding rates of up to 100% depending on TRL] and a focus on market activation I [regular calls with funding rates of 40-45% of the extra costs compared to a conventional technology]. A network of 50 charging stations has already been deployed between 2006 and 2016 and 50 more will be constructed until 2020. Activities are strong in all sectors, leading to the world's first fuel cell train, a project range for ships, logistics, special applications, and household CHP. NIP I triggered follow-up investments of 1:3 – 1:4.

Cooperation of stakeholders among the whole value chain is needed:

Stakeholders need to cooperate even more closely in the precompetitive field of Hydrogen technologies. This provides the basis for successful innovation chains covering the entire range from basic research to implementation in pioneering business models.

The competitive production of green Hydrogen is a make-or-break issue:

To date the hydrogen production has centered on fossil fuels, mainly natural gas. In the future, producing hydrogen from renewable energy has potential to deliver large volumes of hydrogen for multiple uses at competitive cost. The competitive production of "green" hydrogen on an industrial scale is a make-or-break issue on which all further action depends. Different approaches can be considered: alkali, PEM and high-temperature electrolysis as well as methane pyrolysis.

In Germany, 50 stakeholders from science, industry and civil society are cooperating in the Kopernikus project "Power-to-X" to identify the uses of "excess electricity" that are most promising in economic and technological terms in specific industries. Hydrogen plays a key role in this context. With a duration of ten years and a budget of up to 100 million euros, the project links basic research and application.

Jupiter 1000 gathers 9 French partners. It is the first Power-To-Gas demonstrator in France using renewable electricity for alkaline electrolysis (0,5MW) and PEM electrolysis of water (0,5MW). The obtained Hydrogen (25 m^3/h) is directly injected into the methane grid or through association with industry can used captured CO_2 to make methane.

Hydrogen for reducing the steel and chemical sectors' carbon footprint:

The German project"Carbon2Chem" involves Thyssenkrupp and a consortium of global players and research institutions which works to use "green hydrogen" to enable the industrial use of steelworks emissions. This would help to significantly reduce the steel and chemical sectors' carbon footprint. After a period of only two years, a "world premiere" has been achieved in September 2018: an industrial testing facility in Duisburg was the first to produce Methanol from steel industry gases.

Hydrogen is a key raw material for chemical production. The market size was about 56 Mt in 2017: 55% for ammonia, 33% for petrol refining and 9% for other major chemicals. Future new applications of Hydrogen (Energy storage, Energy carrier, CO_2 re-utilization…) will increase demand for Green Hydrogen. Steam Methane reforming (SMR) is the main production method for Hydrogen globally but produces 9 t of CO_2 for 1 t of Hydrogen. Water electrolysis (using much power with oxygen as by-product) or Methane pyrolysis (using little energy with solid carbon as by-product) can be preferred CO_2 free technology depending on local conditions.

BASF leads a consortium evaluating methane pyrolysis since 2013. Successful operation has been conducted on laboratory scale allowing the identification of promising reactor concepts. Carbon sample production via pilot scale has been achieved in 2016. The resulting by-product carbon can be used by steel industry, aluminium production…

Hydrogen deployment is not only about technological issues:

In this process, it has become clear that a legal framework conducive to innovation is just as important as research and development. Only regulatory activity can ensure that innovative ideas are translated into successful business models. Interdisciplinary research on business models, legal barriers, digitalization and energy technologies are required.

There are some incentives to promote Green Hydrogen in the European and national law, however they are not sufficient in particular against the background of the arising charges for the electricity consumption.

Hydrogen is an opportunity for decarbonizing the energy mix. Its direct sale to industries is on the short to medium term the most economic valorization option. The competitiveness of Hydrogen in other sectors is still to secure and a suitable framework involving an adequate CO_2 value is still to build.

Franco-German cooperation on Hydrogen and follow-up of the conference

- After this conference, France and Germany will draft a core aspects paper on "green" hydrogen, highlighting the most important fields for action for European decision-makers.

- Regarding the projects funded by the European FCH JU since 2008, there is historical and strong cooperation between French and German companies and research organizations. Building on this experience, Max-Planck society and CEA cooperation establishes a high-potential partnership with complementary skills on Power-to-X: a common strategy on Power-to-X and Carbon capture and utilization has been set-up. The next step is to launch an ambitious Franco-German project with a well-balanced Franco-German industrial consortium, on Power-to-X including the preliminary phase at the laboratory scale followed by a demonstration phase at the pilot scale. This project will use complementary skills to advance much faster to a demonstration project. High temperature water splitting delivers Hydrogen that can be combined with CO_2 to make Methanol that is a platform molecule useful for chemistry. The project will also deal with new catalytic reactor able to deliver a range of high added value molecules from Methanol.

- Aiming at accelerating network upscaling and adaptation for transmission of new gases (Hydrogen, Methane, Syngas, RNG) for which there are needs for standardization. GRTGaz plan to set-up a collaborative and shared innovative platform named FenHYx equipped like a transmission network in real conditions. Mutualizing of the R&D effort at a European scale, the equipment of FenHYx will be used to propose and develop common approaches for TSO across Europe towards increase of hydrogen injection into the gas system, its impact and necessary adaption for a safe and efficient operation of the grid (e.g. adaption of maintenance procedures, customer impact, …). Cooperation with German partners on the setting-up and the operation of FenHYx platform would be much welcome.

- Germany (BMBF) and France (MESRI with ANR) have decided to take the lead and provide up to 20 million euros for bilateral projects carried out by companies and research institutions in the field of storage and grids. Together we can achieve a new dynamism. The call was launched in October 2018; deadline for applications is the January, 9th 2019.

- The French government launched the 9th of February 2018, 8 calls for proposals related to the ecological and energy transition in the framework of the programme “Demonstrators for the ecological and energy transition”. These calls for proposals will give a financial support about 300 M€ for excellent Research and Development projects. All the Calls for projects are published in French online. French authorities have decided to open the calls for projects of “Investment for Future” in the Energy area to collaborative projects of French stakeholders to international cooperation. Storage and Hydrogen storage as well are eligible in the calls regarding “Energy efficient industry”, “optimized smart grids” and “Renewable energy”.