BDI The Voice of German Industry

FRANCE INDUSTRIE

Mouvement des Entreprises de France

Joint Declaration

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Decarbonisation | Hydrogen

Together for a competitive European hydrogen market by 2030

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A competitive European hydrogen market by 2030 – a Herculean task

As Europe wants to become climate neutral by 2050, The European Union can play a ground-breaking role when it comes to innovative technologies and infrastructure projects that pave the way into a renewable[1] and low-carbon[2] hydrogen economy.

Industrial companies in France and Germany have taken up this challenge. The transformation requires huge amounts of renewable and low-carbon hydrogen. This is essential for the decarbonisation of main parts of the industry. A European and eventually a global framework is needed to face the huge challenges ahead. France and Germany could and should be the engine driving the European efforts to develop a hydrogen economy and build up the necessary infrastructures. If Europe succeeds in coordinating research, development, and demonstration projects in industrial dimensions there are excellent opportunities for Europe to become a technology leader in the global hydrogen market.

These issues are moreover to be considered in the context of the war in Ukraine and its consequences which fundamentally reshape the geopolitical rationale of the EU energy policy, highlighting the dependency of numerous Member States and industrial sectors on Russian oil and gas imports. BDI and France Industrie welcome the first sets of measures presented by the Commission in its REPowerEU communication, presenting hydrogen as a decisive means to ensure EU strategic autonomy.

The market will drive the decarbonization of Europe: What needs to be done?

Expand renewable and low-carbon hydrogen production capacities:

All forms of renewable and low-carbon hydrogen will be needed to ensure the much-needed decarbonization of European industry. To produce renewable hydrogen, European generation capacities should be expanded to 90-100 GW (LHV) by 2030 as proposed by REPowerEU. Access to much more low-cost (renewable) electricity will be the key prerequisite. However, this exclusive focus on renewable hydrogen puts the rapid uptake of a hydrogen market in the EU at risk and ignores the fact that both renewable and low-carbon hydrogen can efficiently help decarbonise the existing hydrogen consumption. Indeed, many European

[1] Renewable hydrogen: as defined in the renewable energy directive (RED) – i.e., The GHG emission savings from the use of RFNBO shall be at least 70 percent from 1 January 2021.
[2] Low-carbon hydrogen: as proposed by the Commission in the revised Gas Directive currently under discussion, hydrogen produced from non-renewable sources, which meets a GHG emission reduction threshold of 70 percent

countries are moving towards or already have a low-carbon electricity mix, which is a considerable advantage for low-carbon hydrogen production through electrolysis. Considering the emergency of limiting global warming, the European Commission shall not limit the hydrogen market to renewable hydrogen. All technologies allowing for the production of renewable and low-carbon hydrogen should be allowed. Low-carbon hydrogen should be defined using a thoroughly defined GHG emission threshold, as envisioned in the revised Gas Directive. It should be backed by a robust methodology to calculate the carbon content and ensure the threshold is respected.

To support the industry in modifying production processes from fossil fuels or fossil H2 to renewable and low-carbon H2, CfDs (including CCfDs) need to be implemented.

Create transport networks:

An EU-wide infrastructure is needed to transport hydrogen. The development of a hydrogen market should therefore be jump-started by repurposing existing natural gas networks. By the end of 2030, start-up investments of about [660 million euros] or more are needed to realize a first H2 backbone.

However, BDI and France Industrie recall the importance of a gradual approach for regulating hydrogen infrastructure at EU level, in line with the EU Hydrogen Strategy. In order not to hamper the development of a viable renewable and low-carbon hydrogen market, there is a need to facilitate investments in production capacities at regional cluster level before linking them through backbones.

Introduce international standards:

Framework conditions for the use of hydrogen must be harmonized at the European level at least. This includes a classification and certification system based on the carbon footprint of climate-neutral gases, taking into account the full LCA. This framework should also be applied to imported hydrogen to avoid competitive distortion and preserve European industries. Regarding hydrogen imports, the EU dependency on third countries shall be carefully monitored.

Build robust and diversified energy partnerships:

Coordinated and strategically smart energy partnerships should be speedily established with a variety of like-minded countries and joint pilot projects implemented. Supporting instruments for European industries, such as contracts for difference – or CfDs (including carbon contracts for difference – or CCfDs), are needed to finance the accelerated uptake of low-carbon and renewable gases.

French and German industries enhance cooperation

As the European Green Deal unfolds across the EU, French and German industries are driving forward their transitions to live up to the ambitions laid down in the EU Climate Law.

Hydrogen is one of the key means not only to decarbonise energy-intensive industrial processes, but in principle also to cut-down CO2 emissions from transport, heating, power generation and many other applications. While hydrogen currently only accounts for less than two percent of Europe's energy consumption, mainly in industrial applications in the chemical industry, the hydrogen strategy's ambition of July 2020 was to install at least 40 GW of renewable hydrogen electrolysers in the EU by 2030 in addition to 40 GW import potential. The REPowerEU communication has significantly increased this ambition with between 25 – 50 bcm worth of H2 produced in the EU and imported, equivalent to about four to eight percent of the EU's natural gas consumption today.

The European hydrogen value chain must therefore achieve its own transition, from a niche and tailor-made market to a much more mainstream market, to reach maturity and provide the means for climate neutrality, without destroying the value currently created on the existing hydrogen markets. The uptake of the hydrogen market, and as such also a low-carbon economy, will be inconceivable without expertise and support of the European industry.

The EU Green Deal is a historical shift which French and German industries are ready to take up, and a great opportunity to strengthen the EU's industrial competitiveness and know-how in sustainable production of manufactured goods.

The manufacturing industry has taken on its responsibility and significantly reduced its carbon footprint. Nonetheless, the EU climate ambitions require huge investments and predictability to decarbonise

industrial manufacturing processes and products. And, for now, the means are not yet matching the ambitions. French and German industries are concerned that the evolution of the EU legislative framework will damage EU industrial competitiveness: the EU strategic autonomy and global competitiveness must not be impacted.

The transition towards a low-carbon energy mix and industrial sector therefore requires a smart enabling framework and a holistic mix of instruments based on a comprehensive toolbox at EU level.

Today, the whole expertise and best practice knowledge has been developed and refined by the major producers, transporters, and users in the current, limited but valuable, hydrogen market. These actors of the French and German industries wish to share their insights on their hydrogen value-chains to deduce how the European hydrogen market must evolve for it to play the most efficient and significant role across all end-use sectors in the transition to a low-carbon economy.

To illustrate these best practices, BDI and France Industrie members decided to organise themselves around concrete technological projects aiming at supporting the development of a comprehensive European renewable and low-carbon hydrogen industrial value chain to achieve climate neutrality and strengthen their strategic autonomy. Among other aspects, these projects highlight the best legislative tools to provide the right incentives for the industrial actors to contribute to the hydrogen value chain.

1. Transversal considerations for an efficient European Hydrogen value chain

Hydrogen as a key means to guarantee the EU strategic autonomy

The EU Hydrogen strategy of July 2020 sets the ground for the development of a hydrogen economy. In the meantime, there is a clear understanding in Europe of the decarbonization potential of hydrogen, which has been translated into a political push towards producing and using more hydrogen. But also, other countries have been developing incentives to stimulate hydrogen production and usage. Now is the time for Europe to take it a step further and truly deliver.

A first milestone has been reached by the European Commission by approving, under EU state aid rules, 76 projects on hydrogen and on the development of a European hydrogen value chain.

"IPCEI Hy2Tech" and "IPCEI Hy2Use" are important funding instruments to build up a European hydrogen value chain. In order to scale up the entire hydrogen value chain in parallel (generation of hydrogen, transport, storage, usage) and to give companies planning and investment security, a quick implementation of the remaining IPCEI hydrogen projects is necessary.

Several other projects should be supported under the regime of the new climate, environmental protection, and energy state aid guidelines (CEEAG), that applies to all technologies that can deliver the European Green Deal. The development of hydrogen could also be supported by a 'low-carbon industry' IPCEI. Also, the Connecting Europe Facility can provide financial support to those projects that are listed as Projects of Common Interest. Indeed, hydrogen infrastructure is included in the scope of the Trans-European Networks for Energy (TEN-E).

The increase of hydrogen production, from both low-carbon and renewable sources, and the accelerated decarbonisation of all sectors thanks to hydrogen, as proposed in the REPowerEU communication is also a strong and positive political signal, presenting the hydrogen value chain as a means to reduce the EU's dependency on external energy sources, especially natural gas from Russia.

It is essential to support the ramp up and the resilience of the European renewable and low-carbon hydrogen value chain and ensure fair international competition which respects a level playing field and equivalent high standards on hydrogen. Diversifying suppliers will also be needed, so that the EU does not create new excessive dependencies on imported hydrogen such as the current dependency on natural gas.

Research and technology

To achieve climate neutrality, the EU must consider the appropriate and comprehensive use of all the research and technologies that support this objective. During a transitional period, available emission reduction technologies need to be supported in order to reach the EU Green Deal targets. Especially in the context of hydrogen production, all renewable and low-carbon solutions, contributing to decarbonization, have to be supported. In this context, in addition to direct electrification, several production technologies can be mentioned: electrolysis, steam methane reforming combined with carbon capture and storage, hydrogen-based fuels (e-fuels), renewable and low-carbon fuels, gaseous and liquid hydrogen derivates and hydrogen carriers, production of hydrogen from

biomass, plasmalysis of methane, etc. BDI and France Industrie are committed to focusing their interest on the most economically available hydrogen solutions, maximizing emissions reduction.

Achieving competitive hydrogen pricing

Demand for renewable and low-carbon electricity is expected to grow tremendously, especially for industries shifting from fossil fuels to electricity for several production processes and needing continuous hydrogen supply.

Against this background, French and German industries advocate for an accelerated hydrogen availability and industrial decarbonisation at a competitive cost. We see low-carbon hydrogen production as one key enabler in allowing the hydrogen market to grow rapidly and stabilise, while renewable energy assets will continue to develop.

Industries call on decisive political support in order to overcome regulatory and technical issues

Given the massive need for renewable power assets, French and German industries very much support the removal of stringent barriers to permitting procedures. Regarding the renewable power assets used for electrolysers, we understand the need for additionality criteria but are convinced that additional RES targets and Guarantees of Origin may serve this purpose thereby not limiting the production of renewable H2 to the commissioning of specific new RES installations. The existence of a PPA must not be obligatory in order to avoid limiting the potential for domestic renewable H2 production. Imposing limits on the operation dates of electrolysers relative to renewable power assets is highly undesirable as it creates a major barrier for renewable hydrogen projects. Moreover, in order to kick off larger electrolyser projects and considering the difficulty for industry to access PPA contracts in some regions, also renewable electricity assets which were subsidized in the past should be able to be contracted. Finally, we should avoid at all costs to waste useful electricity by creating barriers for its recovery, when production is intermittent for instance.

In order to scale-up efficiently the supply of renewable and low-carbon hydrogen, to lower the cost and to increase trust in the value chain, CfDs (including CCfDs) for industrial processes using hydrogen and Guarantees of Origin (GOs) will be needed. In addition, investment support for electrolysers can cover the first mover disadvantages to secure the required steep ramp up.

Furthermore, given geopolitical considerations, reduced strategic energy dependence becomes increasingly important. As a consequence, French and German industries therefore call also for boosting hydrogen production located within the EU and to prioritise securing and controlling our energy storage and supply capacities. However, where European hydrogen production will not be sufficient for the industrial and heavy-duty transport demand, it is important to work on partnerships to secure future imports and control the quality of imported hydrogen (especially respect of the GHG emissions threshold).

Regarding the development of hydrogen infrastructure, BDI and France Industrie recall the importance of a gradual approach for any regulation initiative at EU level as called for in the EU Hydrogen Strategy. There mainly is a need to facilitate investments in production capacities at regional cluster level. The development of hydrogen infrastructure is still at an early stage and national market conditions may evolve differently between Member States. Especially in the early stages of market development an ambitious approach to repurpose existing gas grids could be taken into account in case the market justifies this.

Examples of technology projects that would illustrate solutions to the issues raised in this section

In the framework of the development of a Hydrogen IPCEI, **Air Liquide** with **Siemens Energy** will build a 200 MW proton-exchange membrane (PEM) electrolyser for the production of renewable hydrogen that will contribute to the decarbonisation of the Normandy industrial basin.

Linde will build, own, and operate the world's largest PEM electrolyzer with a capacity of 24 megawatts. Constructed by ITM Linde Electrolysis, a joint venture between Linde and ITM Power the electrolyser will start its production in 2022 at the Leuna Chemical Complex in Germany to supply industrial customers with renewable and low-carbon hydrogen. The project will receive funding under the Hydrogen IPCEI.

The project “GETH2 IPCEI” will link Lingen site in Lower Saxony where 300 MW electrolysis shall be built to the Ruhr region via a 135 km pipeline already from 2024 onwards. This pipeline will be part of the larger H2ercules project announced by **RWE** and **OGE**. Those companies are planning to build up 1,500 km pipelines stepwise until 2030 from the North of Lower Saxony via the Ruhr region and along the Rhine River South to Baden-Württemberg and Northern Bavaria. OGE will run the pipelines, RWE will feed-in H2 from imports and additional electrolysers close to this pipeline link.

Bosch will industrialize its decentralized fuel cell system within the Hydrogen IPCEI "Hy2Tech" in Europe. Starting series production in 2024 with capacities of 200 MW in the first year, Bosch will increasingly contribute to decentralized energy supply in urban quarters, commercial buildings, industrial plants, and data centers.

TotalEnergies: In the framework of the development of a Hydrogen IPCEI, TotalEnergies is developing with ENGIE the Masshylia renewable hydrogen project at the La Mède biorefinery. The project will be supplied by renewable power coming from dedicated solar and wind farms. The capacity of the electrolyzer can reach up to 125MW to produce over 10,000 tons of renewable hydrogen a year, meeting the needs of the biorefinery and reducing its CO2 emissions up to 140,000 tCO2/year.

2. Building a strategic hydrogen value chain in Europe

To achieve a comprehensive and functioning hydrogen value chain and market, industries must be able to develop and master the three parts of the chain: Production and sourcing, distribution and infrastructure, as well as applications and end-uses.

Production and sourcing

Production is the first step in the creation of a market-driven value chain for hydrogen, as the key objective is to create and guarantee a secured access to renewable and low-carbon hydrogen. In order to meet hydrogen demand (as feedstock or energy carrier), several points need to be taken into account:

As explained, BDI and France Industrie are convinced that using the cleanest energy to produce renewable and low-carbon hydrogen is necessary for the hydrogen to contribute to achieving climate neutrality. However, renewable energy assets need to be ramped up, particularly because several sectors, amongst them industry, will also often rely on direct electrification. Against this background, in the meantime indeed also low-carbon hydrogen technologies will have to play a key role in decarbonization as well as potentially imported renewable / low-carbon hydrogen.

Guarantees of Origin (GOs) play an important role for the further development of renewable assets. BDI and France Industrie believe it is of key importance to rapidly define and implement at EU level harmonised certification and GO systems for low-carbon and renewable

(including from biomethane) hydrogen. For hydrogen there should be specifically dedicated GOs based on transparent methodologies to calculate the carbon footprint of the hydrogen produced.

There is a strong need for mechanisms to stimulate demand and production for renewable and low-carbon hydrogen. This applies to grid connected onshore- and hybrid offshore electrolysis.

French and German industries stress the urgency of defining and scaling up the use of CfDs (including CCfDs) to support the economic viability of supplying and using renewable and low-carbon hydrogen in industrial applications. Given the volatility of the natural gas price, renewable and low-carbon hydrogen is expected to become less expensive compared to fossil hydrogen in the next years. However, the war in Ukraine does warrant for unpredicted price developments. CfDs (including CCfDs) is an instrument that helps sharing the financial risks of CO2 reduction projects in energy-intensive sectors, thus keeping financing and investment costs for companies at sustainable levels.

Examples of technology projects that would illustrate solutions to the issues raised in this section.

The Trailblazer electrolyser project in Oberhausen, Germany, consisting of a 30 megawatts electrolyser plant, operated by **Air Liquide**, is counting on carbon contracts for difference (CCfDs) to supply industries that source grey hydrogen today at much lower costs.

Examples of legislative best practices or subsidies programs that would support the issues raised in the section.

The RED3 Directive should define specific mandates for renewable hydrogen (RFNBO) consumption in the industry and the transport sector. These mandates are relevant to incentivize the demand. BDI and France Industrie ask for similar mandates for low-carbon hydrogen.

To encourage the ramp-up of renewable hydrogen production in Europe, there is an urgent need to provide legal certainty for investments and projects with regard to the criteria for crediting renewable hydrogen, RFNBOs and RCFs under the Renewable Energy Directive II. The criteria in the respective delegated acts should be set as flexible and pragmatic as possible to foster further investments into renewable and low-carbon hydrogen.

Distribution and infrastructure

BDI and France Industrie call for a clear and efficient regulatory framework regarding the construction of the necessary H2 infrastructure.

Hydrogen today is normally produced in industrial areas and is usually consumed on-site.

The development of pipeline infrastructure and its regulation is urgently needed and must go hand in hand with extending the electricity grid and increasing renewable power production to avoid bottlenecks in the production of renewable hydrogen. Existing natural gas infrastructure should – where possible – be refurbished or repurposed to transport hydrogen over longer distances. While the main part of the H2 grid will therefore be installed under a general regulation – a more pragmatic approach is required to support the private H2 infrastructures.

However, French and German industries believe that it is also essential to take into account the specific characteristics of the current existing H2 markets and include special provisions where necessary, as technologies and infrastructures have been designed according to customers' specifications (size of the flow needed, reliability, purity, flexibility) to ensure a safe, reliable and qualitative supply that is of utmost value to current industrial customers. These parts of the H2 infrastructure as they exist now should remain unregulated under private control. Consequently, the development of an interconnected and widely accessible H2 infrastructure and market should take into account the needs and expectations of existing and future H2 consumers. European H2 backbone and unregulated private H2 pipelines should coexist and may gradually evolve into a regulated interconnected system as soon as market scale-up will justify it.

Considering vertical unbundling, BDI and France Industrie note that the ITO model, applied to electricity and gas, has proven to work well and that there is no reason to question it in this package.

Finally, H2 storage infrastructure is seen as a solution to avoid wasting renewable electricity surplus produced in times of low demand. However, these infrastructures are costly, which increases price of renewable hydrogen. Freely (or easily) accessible at competitive prices are therefore a firm prerequisite for the development of such infrastructure, for both industries and domestic users.

Examples of technology projects that would illustrate solutions to the issues raised in this section.

TotalEnergies: The "LeunaPower2Fuels" project aims to produce up to 120 kta of PtL at the Leuna refinery by the end of the decade via the Methanol-to-Jet process. We are transforming existing units at the site and will replace fossil H2 produced via a CO-shift with green H2, which will result in a significant reduction of the CO2 emissions (>800kt/a) of the refinery. A high volume of green H2 (120 kt/a) will required to be supplied in a continuous and reliable manner.

Application/End-Use

A comprehensive fully developed European hydrogen value chain will support the decarbonisation of the whole economy.

First, hydrogen plays a key role in industry. In addition to the already existing hydrogen applications in the chemical industry, numerous highly energy-intensive processes, such as steelmaking, can be decarbonized by using renewable and low-carbon hydrogen. CfDs (including CCfDs) can help scaling up the using of H2 in the industry.

Road transport will also benefit from hydrogen, in particular through the broader roll-out of fuel cells or hydrogen engines for heavy-duty vehicles and some light duty segments such as taxis or professional vehicles. Hydrogen, including fuels for which hydrogen is used as a feedstock (PtX), might also provide a decarbonisation solution for other mobility sectors such as aviation, maritime or railway.

From a general perspective, the regulatory framework should ensure a level-playing field between all solutions available for the decarbonation of end-use sectors (e.g., transport, building, industry), to let the market determine the most cost-effective option. In this context, hydrogen will be allowed to reveal its true added value in comparison with other solutions, and additional applications of hydrogen may arise where it is most relevant. For instance, hydrogen may be particularly suited as a fuel for high-temperature heating processes in the industry, as a complement to direct electrification for processes requiring lower temperatures.

Finally, French and German industries advocate for synchronised incentivising both production and demand to enable economies of scale, when appropriate, whilst regional dedicated solutions such as on-site production of hydrogen for industrial use should also remain possible.

Examples of technology projects that would illustrate solutions to the issues raised in this section

Bosch has already installed demonstrators for 20 percent blend and 100 percent H2 boilers in several EU (DE, NL) and extra-EU (UK) countries which showcase the technological advances regarding heating in the end-use sector. As such the buildings sector provides opportunity for direct offtake and market-wide consumption potential. In addition, these technologies can easily work in synch with electric heat pumps thereby providing rapid opportunity for decarbonisation of heating use through optimal use of technology in line with seasonal fluctuations.

Further, Bosch's highly efficient solid oxide fuel cell system (SOFC) is a key technology for reducing CO_2 emissions and reaching climate neutrality across all end-use sectors. The SOFC enables a sustainable, decentralized energy supply with an overall efficiency of over 85 percent by working on renewable fuels (hydrogen from wind or sun, for example) and conventional fuels (biomethane or natural gas) to generate electricity and heat. (Link: https://www.bosch-sofc.com/)

Linde holds a ten percent stake in Hydrospider AG, a joint venture that aims to accelerate the decarbonization of heavy-duty vehicles and will become the exclusive hydrogen supplier for up to 1,600 fuel cell trucks to be delivered by Hyundai Hydrogen Mobility (HHM) to Switzerland by 2025

TotalEnergies: TotalEnergies continues to roll out filling stations as part of the H2 Mobility joint venture in Germany to develop the hydrogen mobility ecosystem. In 2021, the joint venture operated 90 stations, more than one quarter of which are based on the TotalEnergies service stations network.

Imprint

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