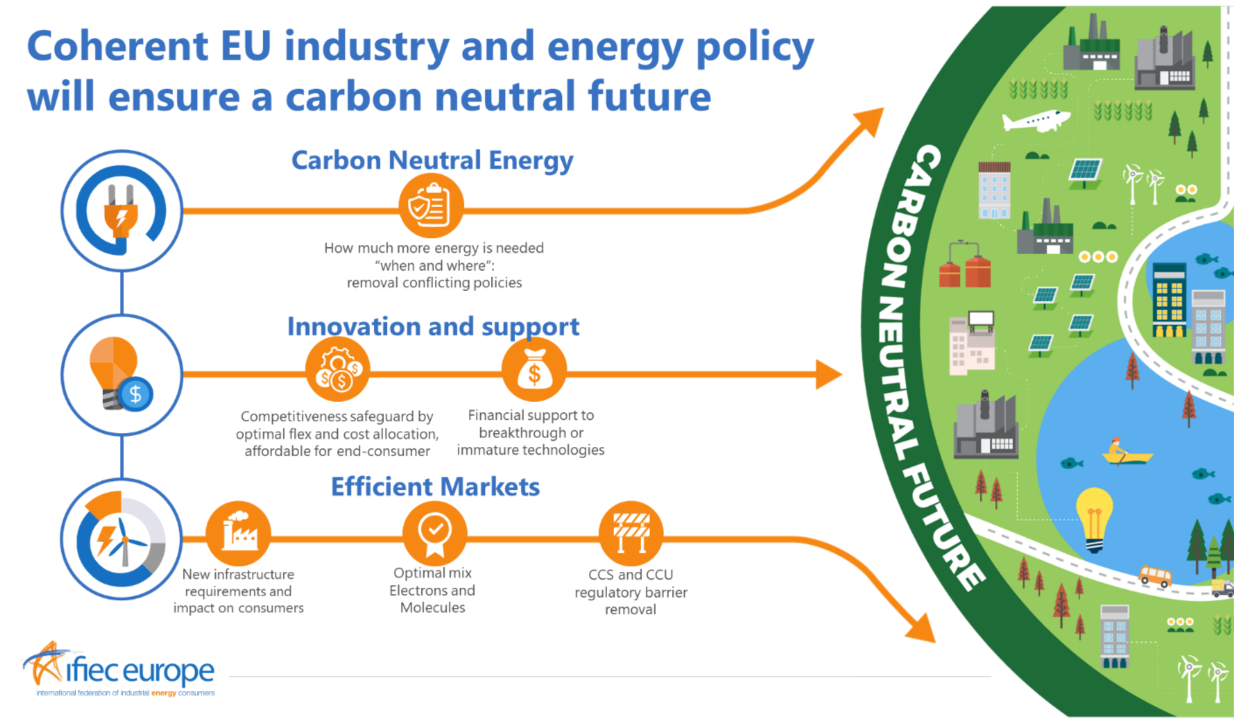
IFIEC response on EU Hydrogen strategy

Abstract:

The European industry faces major challenges to reduce its emissions related to both energy consumption and feedstock usage. Hydrogen will play an important role towards a carbon neutral society. A coherent EU industry and energy policy will be one of the main key success factors.



IFIEC welcomes and in many aspects supports the EU hydrogen strategy as a policy framework to foster the implementation of hydrogen within the European Union. Electrolysis will be one on the main technologies to produce hydrogen, preferable produced by renewable sources e.g. offshore wind. Also because of the high conversion coefficient from electricity, hydrogen production will also contribute to an increasing energy demand. According to IFIEC the energy transition needs more energy which implies that conflicting policies like the absolute cap on energy use in the EED, which should be revised by distinguishing between fossil and renewable energy.

By scaling up their use of hydrogen, Energy Intensive Industries will play a key role in developing a sizeable, well-functioning clean hydrogen market and a cost-effective infrastructure. Competitiveness safeguarded by optimal flexibility and costs allocation should lead to affordable prices for end-consumers. Financial support to breakthrough or immature technologies are prerequisite for its success.

Hydrogen as well as electrification and CCS need new infrastructure, that also accommodate the necessary cross sectoral integration, which is a precondition for more energy efficiency and flexibility. Efficient markets, including hydrogen, by more liquidity will foster the participation of all kind of prosumers via demand side responses. This will also contribute to an optimal balance between electrons and molecules. IFIEC members will contribute to reach the stretched targets of the green deal, but before 2030 this will only be possible if more hydrogen can be produced in combination with CCS and CCU. We ask the Commission to remove all barriers that hinders the development of CCS and take CCS on board as one of the main pillars of a coherent industry and energy transition policy.

1. Introduction

IFIEC welcomes and in many aspects supports the EU hydrogen strategy as a policy framework to foster the implementation of hydrogen within the European Union. We agree that hydrogen will play an important role towards a climate neutral society as well that particular Energy Intensive Industries, by scaling up their use of hydrogen, should play a key role in developing a sizeable, well-functioning clean hydrogen market and a cost-effective infrastructure. Industry fosters the development of innovative sustainable technologies and products with carbon and hydrogen as important building blocks for fuels and products. IFEC believes in an organic rollout and phased development of a hydrogen infrastructure, consisting of carbon neutral hydrogen production, transportation, storage, connections and interconnections. In time, from a local and national infrastructure via a regional European to a European-wide hydrogen supply system. A system that is both reliable and affordable for users.

In reference to the EU hydrogen strategy, IFIEC is happy to take the given opportunity to contribute a number of relevant aspects which both may be helpful to implement the EU hydrogen strategy and safeguard the competitiveness of European industry.

2. A Carbon neutral future demands more (green) energy

IFIEC advocates a coherent and consistent EU industry and energy policy including hydrogen to ensure a climate neutral future. This policy includes green energy carriers and feedstocks and circular processes. More assessment is needed when and where more energy is needed and where conflicting regulation may hamper the transition has and consequently has to be removed. This assessment should look into how much energy is needed, where it is coming from, how to displace it over time, at what cost and how this interacts with an EED[1] energy usage cap. Obviously we need more (green) energy. The hydrogen strategy paper of the Commission shows that the production of green hydrogen by electrolysis goes with an additional electricity demand. Based on the current technology, it takes 55 kWh to produce one kg of hydrogen with an energy content of 33,3 kWh. The assessment should include the trade- off between hydrogen and electricity, taken into account the impact of the strong increasing demand by green hydrogen production via electrolysis and the electrification of the industry and other sectors, such as mobility, domestic (households), and ICT data centers (Google, Microsoft, c.s.).

[1] EED: Energy Efficiency Directive

In its Long Term Climate Vision, the EC concludes that the share of electricity in final energy demand will at least double by 2050, whilst the electricity production is expected to increase at least 35 percent more by 2050[2]. This is even an underestimation compared to other studies such as McKinsey[3] or Dechema[4] . An extra transition challenge in producing hydrogen or other products from (low carbon) electricity is the additional requirement of energy at times and locations where it is not produced.

With respect to the forecasted hydrogen production for 2024, IFIEC questions whether the assumptions in the EU Hydrogen strategy paper are consistent and not too ambitious. It is not likely that the installation of 6 GW electrolysis capacity will produce 1 million tons of renewable hydrogen, as it would require an operation time of up to 8700 hrs/annum). Besides, in the strategy paper it is mentioned that the electricity demand for hydrogen production should be enabled in particular at times of abundant supply of renewable electricity in the grid, which is more realistic (lower costs), but will consequently lead to less running hours (2500 hrs/annum!?!). Moreover, the announced plans are uncertain and not yet based on Final Investment Decisions by company boards. In addition, this aim does not seem realistic considering the availability of volatile renewable sources like wind and photovoltaic, especially if the requirements of the Renewable Energy Directive (RED II) would have to be fulfilled. If only renewable electricity peaks are to be used for hydrogen production, a more accurate investment level would increase by a factor between 2 to 3; leading to a potential hydrogen production level of 15GW.

A comparable situation is seen in the hydrogen production extension plan ni phase two, realising 10 million tons in 2030. To get to such high operation hours of electrolysers to produce renewable hydrogen, then either:

- The units operate full-time – using both thermal and renewable electricity, dedicated for hydrogen production and making no contribution to grid stabilization and load management;
- Many more units are needed, if only surpluses of renewable electricity are being used, thereby improving grid stability and renewables penetration. But then, still, the question arises whether there is sufficient surplus electricity from RES-E.

These assumptions lead to uncertainty of a stable and secure energy supply in the public electricity grid and a limited amount of renewable energy needed to cover the (rising) demand for electricity consumption alongside hydrogen production. This is only possible via an enormous expansion of RES-E-generation capacity, which must not lead to huge cost hampering global competitiveness of European industry.

3. Innovation and support

[2] The electricity share will be 53% of the final energy demand. See: European Commission (2018): A Clean Planet for all, A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy

[3] McKinsey foresees a multiplication of electricity needs for industry (from 2000 TWh for BAU to x4 to 9 times). The EC foresees an increase form 3000 TWh (EU-wide) to 4800 TWh in the electrification scenario. The 1.5-scenarios there only foresee an increase to 4000 TWh

[4] Dechema (2017): Technology Study: Low carbon energy and feedstock for the European chemical industry.

The fundamental transformation of Europe's economy towards a green and competitive economy requires fundamental changes and breakthrough technologies. The Green Deal identified clean hydrogen as a priority area where the EU needs climate and resource frontrunners to develop such technologies and commercial applications. An important precondition will be a rapid reduction in production cost of climate-friendly hydrogen to compete with current sources of energy and feedstock production, e.g. the willingness of the chemical or fertilizer industry to absorb the hydrogen produced by electrolysis ('green hydrogen'), depending on the price compared to hydrogen production via steam methane reformers (SMR) or autothermal reforming (ATR) in combination with CCS ('blue hydrogen').

Economic growth, a favorable investment climate and a level playing field are prerequisites for R&D and investments in sustainable technologies and products. This also applies for technologies like hydrogen production including temporary storage of CO_2 (CCS) and developing re-use options for CO_2 in consumer products and fuels (CCU).

The EU Strategy acknowledgesthe need for research and innovation across industry to enable the widespread deployment of hydrogen both as an energy carrier (fuel) and a molecule (feedstock). Priority sectors are identified as refineries, ammonia production and steel-making – as well as the condensed use of hydrogen in industrial sites clusters. However, the strategy is less clear on how hydrogen might be deployed across wider industrial sectors, for example in lime manufacturing, cement making, and glass production. Transition to hydrogen as a fuel and a molecule in these sectors may not be straightforward and will require investment in research and development as well as investments in operational plants to ensure a safe and sound application of hydrogen.

Various incentives and support are needed to stimulate alternative ways of producing climate-friendly hydrogen. Financial support to breakthrough or immature technologies must not be limited to technology innovation support, butalso cover scale ups and the market entry of new products and applications to cover the investment cycles of the industry and to bridge the so-called 'valley of death'. State Aid Guidelines have to take into account EU's global competitiveness rather than being limited to safeguarding a level playing field within the EU.

IFIEC believes the simplifying segmentation of hydrogen production technologies to different colors, e.g. blue, grey, green, yellow and purple, to be of limited use. Instead the focus should be on the supply of carbon neutral molecules, e.g. hydrogen, from well-to-gate. These supply-system emissions should also be the basis for governmental aid to avoid hampering a hydrogen market development.

Against this backdrop, IFIEC supports the EU-intent to produce hydrogen through a variety of processes, including production based on fossil feedstocks with carbon capture technologies (CCUS). In our view, the definitions of "Electricity-based hydrogen" and "Renewable hydrogen" should be extended to include other electrolytic routes, e.g. the established Chlorine-alkali process, gasifiers using biobased sources, plasma technology, torrification of biomass, etc. And since in the end, only the GHG footprint of hydrogen matters, also hydrogen based on electricity from nuclear plants is a viable option as long as nuclear energy is part of the electricity generation mix.

Development of innovative electrolysis, create production volume and reduce production costs. As long as renewable hydrogen is not yet cost-competitive, financial support is needed to scale up production technologies. There are different instruments that can be used in this regard:

- IFIEC acknowledges the policy instrument "Carbon Contracts for Difference" as an instrument that can incentivize investments in new technologies in Europe to bridge the cost gap compared to conventional hydrogen production;
- This policy instrument should be technology-neutral and hence, not limited to renewable hydrogen production technologies but all hydrogen production technologies with low well-to-gate greenhouse gas emissions. Also, it should be open for all industrial sectors/applications/processes to ensure decarbonization at an efficient cost level. The financial support to deploy hydrogen in industry should also be technology neutral. Although it is recognized that some sectors (such a steel-making and fertilizers) will be better placed to accelerate the deployment of hydrogen, they are not the only sectors and the investment incentives should not deter early deployment in other sectors;
- Financial support should not be limited to certain technologies, neither on supply nor demand side;
- In addition, to reduce operating costs of electrolysis or other appliances and technologies producing green hydrogen should be exempt from surcharges on electricity used to produce hydrogen;
- Finally, support measures should be financed from the state budget, to avoid new surcharges (which in turn would require additional exemptions rules).

4. Transparent and liquid hydrogen markets

4.1. Transport and infrastructure

In transport of energy, there is evidence that the costs of transportation of electricity are factors greater than the costs of transportation of molecules (natural gas, hydrogen). However, for an energy end user, transportation costs represent a relatively small part of the overall production costs for their products they produce or assemble. This means that industrial end users should have options to choose whether to receive electrons – and hence locally produce hydrogen - or molecules at their site gate. In other words, the energy supply system should have elements of customization in order to optimize social and individual costs related to social welfare and economic prosperity.

In terms of local distribution of hydrogen production, part of this aspect is the availability of the existing gas grid infrastructure and electricity grid infrastructure in each Member State. In this regard, an optimum has to be found, minimizing overall costs of transport (gas and electricity) and taking into account production and consumption potential. IFIEC believes that the most cost-effective route forward is to kickstart climate neutral hydrogen use around established industrial clusters[5] until 2030, as this would optimize infrastructure investment (backbones) and allow efficient markets to develop between wholesale players (a number of them being prosumers).

---

[5] In these established industrial clusters grey hydrogen in produced from natural gas and mineral oil in large quantities. In adding CCS to these existing production facilities (hence producing blue hydrogen) a kickstart to a carbon neutral hydrogen market including infrastructure, and a transition to green hydrogen production can be generated.

The strategy paper of the Commission supports the so called 'Hydrogen Valleys' . In IFIECs view, the installation of electrolysis may be beneficial in areas where the electricity supply can be realized easily and where the necessary grid utilization is as low as possible, since hydrogen transport may be more economical than electricity transport, given e.g. electricity grid constraints. But in addition, local conditions (e.g. consumption patterns, existing grid infrastructure) have to be taken into account which may lead to electrolysis being best dispersed decentral. This could be an optimal solution especially the early stages of hydrogen market ramp-up. Building electrolysis at/close to industrial consumption centers could allow for easier and quicker installation of electrolysis, e.g. in terms of permits and existing infrastructure. In the end, this should be left to the market, where players should have the flexibility to use either electrons or molecules.

Notwithstanding the above, renewable electricity should be available to everybody, not prioritized for specific consumers, i.e. the basic principle of having a level playing field in the electricity market should not be distorted.

IFIEC prefers a dedicated hydrogen system. If it turns out to be an effective and efficient stepping stone to kickstart a hydrogen supply system. The addition of hydrogen to the national gas supply system may be considered as a temporary measure. In IFIECs view, the rollout of a dedicated hydrogen infrastructure with transport, storage and (inter)connections will be an organic, phased development, following a pathway starting locally/national and than connects local initiatives to a European regional and a European-wide hydrogen supply, that is both reliable and affordable for the users of this infrastructure.

As far as gas is concerned, end users will have to face more volatile composition of gas because of decreasing natural gas production, increasing LNG imports and production of intermittent renewable gasses such as biomethane, biogas and hydrogen. On the transmission level, IFIEC advocates for dedicated hydrogen grids which can be created partly by rededication of gas grids. Dedicated hydrogen grids allow for delivering hydrogen in a pure quality, which is needed by some industrial consumers. Moreover, blending of small qualities of hydrogen into gas grids may be possible on the distribution level, taking account of the quality needs of the respective customers.

As a prerequisite for creating an internal hydrogen market allowing for cross-border trade, quality standards need to be harmonized at a European level.

4.2. CCS and infrastructure

In IFIECs view, Carbon Capture and Storage (CCS) needs much more attention in the hydrogen strategy as it is an essential and most cost-effectively technology for a major reduction of the CO2 emissions in the short run up to 2030 and possibly 2040. In this first period of the energy transition, the production of green hydrogen will not be available at a required volume and efficient cost level . Adding CCS to the production of hydrogen using natural gas and mineral oil (blue hydrogen), presents an opportunity to kickstart a hydrogen market and to reduce emissions in a period (up to 2030) where alternatives are limited. In its report to the European Gas Regulatory Forum of 5-6 June 2019 (Madrid Forum), IOGP, together with several other stakeholders including IFIEC, concluded that CCS can be seen as a long-term investment, since the production of hydrogen can take place close to industrial clusters and provide access to both hydrogen and CO2 transport infrastructure for industries requiring these services to continue operating in a climate neutral economy. In combination renewable feedstock in pre- and post-combustion and process emissions from industry it even may lead to negative emissions. Moreover the report showed that the CO2 emission of electrolysis in the coming decades will be much higher and more expensive compared to natural gas in combination with CCS. One of the reasons is that the availability of green electricity to feed the electrolysis will be limited to meet the demand.

4.3. Import of Hydrogen

In IFIECs view, as in the past also in the future the European Union will not be self-sufficient regarding energy supply. At our best, we will be less dependent on energy coming from abroad. In that context, importing cost efficient hydrogen will be part of the energy mix in the EU.

Considering this fact, IFIEC recommends establishing partnerships with third countries outside the EU and find the economic balance between hydrogen production within the EU and energy dependency.

In this context, the following aspects should be considered:

- When hydrogen is imported ,besides production and transportation costs also GHG emissions should be taken into consideration ((cost optimum per ton of GHG emissions);
- Production of hydrogen outside the EU has to meet hydrogen sustainability requirements of the EU;
- Safeguard measures need to be taken to ensure that production of hydrogen outside the EU will not incentivize companies to leave the European Union.

4.4. Regulation

End consumers want to make use of a hydrogen supply that is climate neutral, reliable and affordable. There is no existing climate neutral hydrogen supply yet. The
supply chain from production - transport - storage - consumption not organized and ordered.
For IFIEC, the most important starting point for such a provision of market regulation is comparable with the electricity and (natural) gas supply. Market where market is possible.
When a (supra)national backbone infrastructure is realised by a public grid operator, access to this infrastructure should be regulated, as with the electricity and natural gas infrastructure. With legal duties and obligations for a network operator (TSO), to be appointed by the government (MS) and with supervision of the national regulating authority (NRA).

A supporting regulatory framework should:

- support and facilitate this development towards a European hydrogen supply system;
- With roles, tasks and obligations for designated TSO's and DSO's and for supervision in order to legally protect network users;
- Where relevant and possible, implement regulation that exists for natural gas and electricity; where effective and efficient, reuse natural gas infrastructure: pipelines, gas storages, import facilities;

- Examine and stimulate the development of a reliable and affordable storage of molecules: hydrogen, ammonia, toluene, methanol, and formic acid as energy carriers;Develop interconnectivity and interoperability with standards for hydrogen quality, pressure, balancing systems, cost allocation and material use.

Where regulatory barriers exist, regulation should be adjusted or even removed:

- An objective and integral assessment of the total final energy demand (electricity and gas, and possibly other energy carriers e.g. heat and hydrogen). This should include an assessment of transition technologies that lead to further increase of the energy demand;
- Energy efficiency is vital for a cost-efficient transition and to ensure availability of limited carbon neutral resources, but the regulation must not limit economic growth and lead to carbon leakage by industry moving out of Europe to regions with low or no climate policies. CCS and CCU regulatory barrier removal: removal of innovation hurdles regarding CCU and CCS in the Monitoring and Reporting Regulation, ETS and CCS Directive.