Working Group Power-to-X for Applications

Position paper on the FuelEU-Maritime Initiative

Registration number
in the register of representative bodies:
976536291-45

April 2020

VDMA

The German Mechanical Engineering Industry Association (VDMA) is the largest European industrial association. The VDMA represents around 3300 German and European companies in the mechanical engineering industry. The industry represents innovation, export orientation, medium-sized companies and employs around four million people in Europe, more than one million of them in Germany. The major players in a Power-to-X (P2X) value chain are organised in VDMA: from renewable energy generation to P2X plant manufacturers (electrolysers, Fischer-Tropsch- and Methanol-to-Gasoline-synthesis, methanation plants, etc.). It also includes the manufacturers for the use cases of hydrogen and P2X across all sectors (e.g. plant manufacturers for steel and chemicals, gas turbines, fuel cells manufacturer, mobile machines, hydrogen-based firing technology for high-temperature processes, shipping & jet engines). The VDMA platform "Power-to-X for Applications" (P2X4A) brings together all the competencies of the important stakeholders, including those from adjacent fields - such as the automotive and petroleum industries.

Deployment of alternative low-/zero carbon fuels with P2X as a main lever

VDMA very much welcomes the initiative of the European Commission to reduce CO_2 emissions from shipping by encouraging the use of low-carbon fuels. The new initiative takes a promising approach by considering a basket of measures to increase the share of any hydrogen-derived fuels (e.g. e-diesel, e-methane or e-ammonia) or sustainable bio-based fuels. We especially welcome the well-to-wake approach and consider the latter as utmost important for any future evaluation of alternative fuels. Discussions about candidates for future alternative marine fuels are on-going, as the internal combustion engine used to propel ships is, sometimes with modifications, capable of burning a variety of synthetic or bio-based liquid or gaseous fuels. Some of these fuels require no engine modification and can readily be used as drop-in fuels which is a benefit considering the long lifetime of ships. The fuels' advantages and disadvantages are manifold and relate to the drop-in capability, required retrofitting of ships and overall costs. Thus, a well-to-wake approach and incentives based on CO_2 emissions are helpful for future decision-making. Furthermore, goal-based performance requirements on carbon-intensity of energy used can be useful means to allow technology- and fuel-neutral solutions.

Greenhouse gas (GHG) emissions from shipping need to be drastically reduced to contribute to the 2050 climate neutrality goal of the EU. Major efficiency improvements will continue to play a role in reducing emissions. However, the switch to sustainable alternative fuels is the biggest lever to significantly reduce GHG emissions in the maritime sector. The direct use of renewable (electrical) energy, stored in batteries, is for most shipping applications no option due to weight and space constraints. The availability of sufficient and verifiably sustainable biomass is still a topic of debate, and its use involves unwanted environmental and ethical side-effects. Against this background, electricity-based alternative fuels (synonyms used are electro-fuels, e-fuels, power-to-liquid/-gas, decarbonised hydrogen-derived fuels) offer a very promising solution. P2X generally describes the production of a fuel or substance (X) based on hydrogen with renewable electricity (P) and has several environmental benefits: compared to biomass, the water demand in P2X is significantly lower. Also, it involves significantly less land use and does not compete with food production.

P2X is the perfect candidate for generation outside Europe in deserted and arid areas with abundant renewable energy resources (wind and PV) while technology, development and asset ownership come from European players.

P2X enables replacing fossil raw materials completely in the long term. Synthetic fuels produced with P2X can be distributed and used in the existing fleet stock without any further changes to the infrastructure. Together with CO_2 as another feedstock, P2X-technologies enable a closed carbon cycle and contribute immensely to the reduction of CO_2 emissions all over the world.
P2X is characterized by a high technology readiness level (TRL). The next stage for technology development is industrial scale-up and commercialisation – which cannot happen without an appropriate regulatory framework. To avoid lock-in investments, VDMA strongly recommends providing a regulatory framework for an early P2X market ramp-up. Only in this way the EU can create the necessary investment security for the development of the P2X value chain.

Seizing industrial opportunities for the EU

VDMA aims for an internationally competitive European P2X industry being able to export its technological solutions globally. P2X involves a long value-chain with all components still present in Europe: from renewable energy (RE) systems to electrolysis and P2X plants to applications and CO_2 capture (from point sources or from direct air). P2X can defossilize existing industry and be an impetus for the formation of new ones. Comprehensive solutions in connection with digitalization, e.g. predictive weather forecasting, are supplementing the hardware delivery. The P2X value chain can thus also contribute to creating many new jobs. This accounts both for European countries and other countries, where P2X can be produced in the future. P2X can contribute to a new quality of international cooperation between the EU and developing countries, e.g. in North Africa.
European technology firms are still technology champions of P2X, and it is now the time to adopt an industrial-policy approach to the market-ramp up. This can also contribute to overcoming the economic crisis we are facing due to the outbreak of COVID-19 and make the climate neutrality goal more achievable.

Organise the market ramp-up with a market-neutral approach

While P2X solutions will be especially crucial in the hard-to-abate sectors such as international shipping, VDMA argues for a market-neutral political framework.
Firstly, a market-neutral approach facilitates the ramp-up of P2X. The cost drivers for producing P2X are the high levelized costs of energy and the capital costs for electrolysis, as well as CO_2-capturing and purification. The smaller part of the costs can be attributed to the synthetic fuel production (via Fischer-Tropsch or Methanol route). VDMA emphasises the need to reduce those cost drivers. Currently, electrolysers are tailor-made. Given the limited demand for electrolysers the manufacturers do not invest in automated production lines. Yet, the technology is ready for industrial scale-up. The regulatory framework should therefore address those use cases first, where immediate business cases can evolve, and potential clients are willing to pay the higher price. This supports scaling-up of the electrolysis industry and leads to more competitive prices. The approach will ultimately help those sectors to adopt P2X solutions that are highly competitive and where there are few alternatives to P2X – as it is the case with shipping. So even though, the FuelEU-Maritime Initiative focuses on incentivising the demand-side of sustainable alternative fuels, the bigger share of investments is required upstream which needs to be addressed in other initiatives in close coordination.
Secondly, a market-neutral approach enables fundamental changes in the refinery and chemical processes making these industries fit for climate neutrality. The production of

electricity-based alternative fuels via the Fischer-Tropsch and Methanol route generates a high spectrum of by-products (see figure below). These by-products can be used as base molecules for further synthesis routes and enable the necessary replacement of fossil crude oil in other chemical processes. The more incentives there are for marketing these by-products, the more economical and efficient sustainable alternative fuel production through P2X becomes.

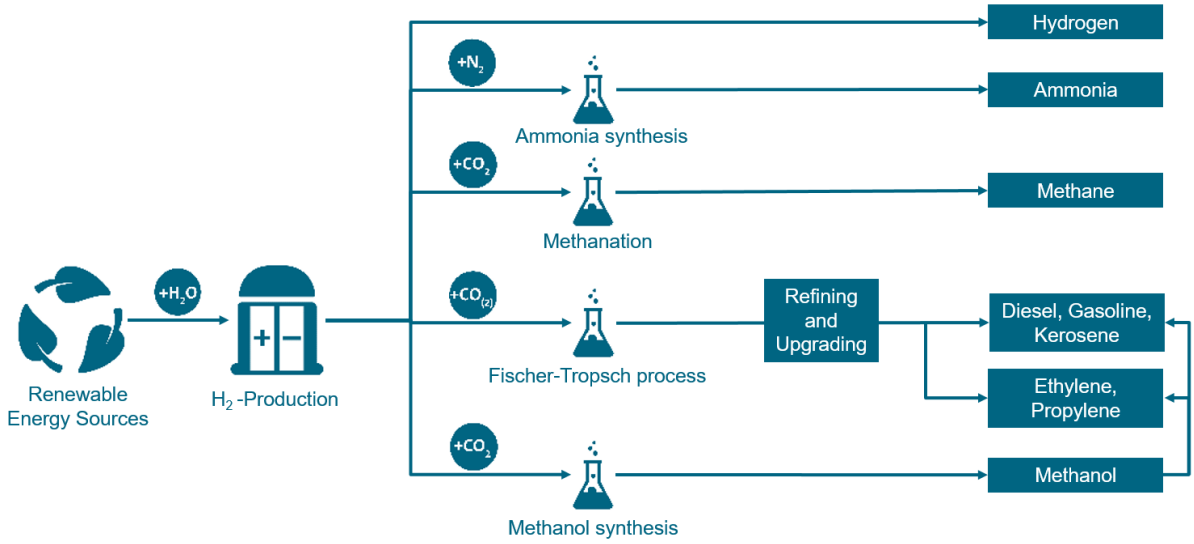

Figure 1 - Overview of P2X fuel production pathways and products (Source: VDMA)

Establish a domestic market for P2X

A strong domestic market is crucial for European technology firms to defend their current technological leadership in P2X. The Smart Sector Integration Strategy should lay out a comprehensive approach towards making use of renewable energy across all sectors. This will lead to a significant increase in gross electricity demand in the coming decades. By comparison, the expansion of renewable energy is progressing far too slowly. Europe therefore needs higher and binding RE targets linked to the increasing demand of sector integration and the P2X market-ramp-up.

Taking a global perspective towards P2X

Europe has a huge potential for homegrown renewable energy. Yet, with regards to space and public acceptance, there will be limits in expanding RE at some point. Globally, however, RE capacity is abundant. The EU will remain an energy importer. P2X can be used on a grand scale for producing electricity-based alternative fuels and we can cooperate with other regions of the world. P2X allows to easily store and transport imported renewable energy from places where wind and sun-derived energy is plentiful and cheap, through an existing infrastructure. In the long run, P2X should be produced in those regions of the world where the levelized costs of renewable energy are most favourable. This is a crucial factor for driving down the costs for P2X. Taking such a global perspective not only involves export opportunities for European technology firms, European project developers and asset owners, but it also ensures that oil-producing countries and other regions of the world can create a new economic basis for the climate transformation and will not be left behind. The EU should therefore promote P2X as a crucial technology for reaching the goals of the Paris Agreement

and engage in P2X partnerships with interested countries. Shipping as an international and globalised sector relies on international cooperation and governance. As a leader in climate politics, the EU can push for more ambitious shipping regulations accounting for P2X at global level and inspire other countries and regions to follow.

Enabling a business case for P2X with the Renewable Energy Directive (REDII)

VDMA appreciates that the proposed EU Initiative will complement existing instruments like the Alternative Fuels Infrastructure Directive (AFID) and the Renewable Energy Directive (REDII). The Renewable Energy Directive (REDII) offers a timely and very promising opportunity to turn sector integration into a business case. It offers the framework to replace fossil-based energy-carriers with renewable hydrogen and P2X in transport, including the refinery process. There is however a clear mismatch between the new climate ambition and the context in which the REDII was negotiated. The focus has now shifted from the need to integrate RE into the electricity system to achieving climate neutrality and the need for sector integration. Therefore, the delegated acts of the REDII need to be implemented in a way that they facilitate an industrial scale-up of P2X. This applies particularly to the question under what conditions electrolysers can take electricity from the grid (Art. 27(3) and rec. 90 REDII). The specification of the correlation in time and geography of synthetic fuel production and RE generation will prove to be a barrier for the uptake of hydrogen and P2X-derived fuels in the transport sector. Those specifications should be relaxed. Guarantees of origins and Power Purchase Agreements (PPAs) should be sufficient proof for the renewable origin of electricity and additionality.
The multiplier for the electricity-based alternative fuels discriminates P2X against bio-based fuels. VDMA argues for a technology-neutral approach. This could be achieved by an immediate increase of the multiplier for P2X. In the long run, technological neutrality in the REDII should be achieved by removing the multipliers and substituting them with a focus on the life cycle assessment of CO_2.

Reform of the Energy Taxation Directive: CO2 pricing as leverage

To optimise the costs of P2X-production a reform of the Energy Taxation Directive is important. To supplement the European emissions trading system (EU ETS), the introduction of a CO_2 price should be included in the Energy Taxation Directive. VDMA advocates that the minimum tax rates should be based on the CO_2 content of energy carriers. In order to reach the levels of renewable “climate neutral” energy needed for the transition, taxation of renewable energy e.g. on electricity needs to be reduced, whilst fossil oil needs a higher price. In order to attain the desired climate protection effect, there should be no artificial overall increase in price but a reallocation according to the climate damaging effect of the energy source. A CO_2 price on energy carriers would create a market-based instrument with a cross-sector approach thus incentivising the use of sustainable alternative fuels. While the proposed revision of taxation systems could incentivise the use of more climate-friendly fuels like decarbonised hydrogen-derived maritime fuels, it should be noted that for a highly international sector like shipping, a carbon pricing policy at international level would be the most effective. While negotiations on measures to implement the IMO GHG Strategy are still ongoing and planned to be finished in 2023, regional interventions might preempt any measures taking by IMO and could be counterproductive. In case negotiations at the IMO fail to deliver sufficient regulations by 2023, the EU has the responsibility to act and continue its leading role, nevertheless.

As some potential future alternative fuels in shipping, like decarbonised hydrogen-derived liquids or gases (e.g. methane), contain (recycled) carbon, CO_2 pricing should create a level playing field for technologies such as Carbon Capture and Usage (CCU) from unavoidable point sources, bioenergy and direct air capture (DAC) to support entry into the carbon cycle.

Market introduction programme

If the CO_2 price is not able to send a strong investment signal for P2X, a market introduction programme can support its uptake. The programme should be limited in time and degressive, include an auctioning approach, reward technological innovation, avoid deadweight effects and should be reviewed regularly. The market introduction programme should stimulate the market ramp-up in all the different use cases of P2X (land transportation, shipping and aviation).

Incentivising carbon re-cycling

The CO_2 to produce P2X-derived fuels (like e-diesel or e-methane) may come from unavoidable point sources, from the use of bioenergy or from the atmosphere using DAC. The use of CO_2 point sources should be limited to unavoidable industrial emissions in the EU ETS, such as from cement industries. Other emissions from fossil refineries, steel or chemical industries could be used as a bridge. Carbon capture and utilisation (CCU) should be acknowledged and rewarded under the EU ETS, subject to a life cycle analysis and clear carbon accounting rules (i.e. avoid double counting, carbon leakage or double penalties).

The VDMA is happy to contribute with its expertise to the further political process of the FuelEU-Maritime Initiative.

Contacts at VDMA

Dr. Carola Kantz
Power-to-X for Applications
Phone +49 69 6603-1400
E-Mail carola.kantz@vdma.org

Peter Müller-Baum
Power-to-X for Applications
Phone +49 69 6603-1353
E-Mail mueller-baum@vdma.org