VERBAND DER CHEMISCHEN INDUSTRIE e.V.
WIR GESTALTEN ZUKUNFT.

VCI complementing position paper

EU 2050 long-term emission reduction strategy

Key messages and recommendations

1) **The low-carbon transition and large-scale GHG reductions in the chemical industry cannot happen at zero cost.** The economic constraints around low-carbon business cases need to be acknowledged by policy-makers when designing a supportive framework. In the absence of international CO_2 pricing schemes and a global level-playing field, measures of strong carbon leakage protection compatible with free trade rules will remain essential for European energy intensive industry.

2) **Radically lowering the price of renewable energy and feedstock presents an indispensable prerequisite for a successful low-carbon transformation**. Guaranteeing certain sectors access to cost competitive low-carbon resources will be necessary, especially to encourage business investments into production routes that involve electrification or that aim at reducing process emissions.

3) **Regulation must facilitate a more adequate understanding of the future demand of energy in the context of CO_2-reductions.** Large-scale electrification of industrial processes will significantly increase absolute energy consumption. Regulatory barriers, such as the absolute consumption limits stated by the Energy Efficiency Directive (2012/27/EU), must be re-defined better fit for purpose.

4) **Substituting fossil carbon resources is a great challenge and in very few cases economically viable at the moment.** Enhanced sector coupling and re-using different sources of CO_2 (e.g. plastic waste) as feedstock for chemical production could present attractive options for optimally reducing emissions in other sectors, such as the steel or cement industry.

5) **R&D funding options need to be directed towards upscaling promising technologies and bringing innovations to the market.** Advanced industrial applications enabling electrification of processes, low-emission fuels and alternative feedstock show high abatement potential and should be prioritized. In general, application procedures must be kept simple to reduce administrative costs.

6) **The transition to a low carbon, circular economy needs to be encouraged and not hindered by the EU regulatory framework.** Closing carbon loops requires a cautious approach because of the high complexity and the need to preserve competitiveness. The transition should be supported by more research efforts on exploring the reduction potentials of sustainable carbon cycle management, supported by comprehensive Life Cycle Assessments of products.

7) **The EU 2050 long-term strategy should aim at providing the necessary visibility for businesses and create certainty for markets**. GHG reduction pathways should be reviewed based on cost and available technologies, but also on other value-adding effects, such as creation of jobs and strategic value chains.

Supporting an ambitious 2050 agenda

Chemistry is at the very core of climate change solutions. Not only can major and already existing pathways to reduce greenhouse gases (GHG) be traced back to technologies developed by the chemical industry. More importantly, a large part of pending breakthroughs necessary to accelerate progress towards a more circular and low-carbon economy will be made possible and provided by chemical companies. By integrating sustainability and cross-sectoral innovations at the heart of business strategy and new products, the sector will continue to cut emissions, improve energy efficiency and enable the wider transformation of the economy towards a socially, environmentally and economically sustainable future.

To this end, we fully support the EU's efforts towards sustainable development and climate change mitigation embedded in international frameworks such as the Paris Climate Agreement and the UN2030 Agenda. Well aware of the strong commitment needed from energy intensive industry to reach these ambitious goals, the continuous improvement of our emission and energy performance has for a long time been a key strategic target. In fact, 1990-2016 the sector reduced its absolute GHG emissions by 48%, whereas specific energy consumption decreased by 50%. During the same period, production growth has increased by 65%, thus remaining a strong pillar of the German manufacturing competitiveness and an important contributor to European employment and economic prosperity.

The EU has set itself a target of reducing emissions of 80-95% by 2050 as a contribution to the below 2-degrees-target established by the Paris Agreement. While this makes the EU an international role model in terms of ambition, such targets will, however, prove ineffective in mitigating global climate change as long as the majority of non-EU countries do not follow similar commitments. Establishing a consolidated and international emission reduction scheme (e.g. CO_2-price) or similar measures, should therefore in all cases be considered the preferred and most effective route for the international community to deliver on the global target.

In the absence of harmonised global efforts, the Commission should in the meantime firmly anchor principles of cost-efficiency and competitiveness in its long-term emission reduction strategy for 2050. This is essential for sectors competing on global markets, in particular the processing industry, who will face increasing challenges to balance short-term costs emerging from higher EU climate targets with the long-term economic viability of their business model. By allowing for systematic compensation options as well as financial incentives, policy-makers can address and improve the general uncertainties revolving around emerging business cases and encourage companies towards large-scale adaptation of low-carbon processes.

Lastly, it goes without saying that the wider transition towards a low-carbon economy will not happen at zero cost and can only succeed with the active support of civil society as a whole. Thus, policy measures must go beyond addressing economic sectors and climate targets and include aspects on strengthening the buy-in and contributions of European citizens and consumers.

Determining emission reduction potentials in the chemical industry

The chemical industry is one of the largest and most diversified industries in Europe, supplying virtually all sectors of the economy with advanced resources, materials and products. It is much because of the deep integration in strategic value chains and complex structure of the chemical industry that there is no “one-size fits all” model when it comes to reducing GHG emissions. Rather, when assessing the emission reduction potentials and the wide-spread economic impacts thereof, a holistic and technology neutral approach must be applied at all times.

The large part of chemical products consists of carbon. While usually in the form of crude oil or natural gas, the chemical industry uses fossil resources not only as an energy source for production, but also as a raw material for its products. From this perspective, “decarbonising” chemical products in a literal sense is neither possible nor necessary, as the carbon is bound in the products and not released into the atmosphere during the use phase of the products.

Correctly speaking, the challenge of “decarbonising” industrial production for the purpose of CO_2 emissions reduction lies in avoiding both energy and process related emissions by switching from current fossil fuels to renewable energy resources, as well as reducing end-of-life product emissions. Regarding the latter, carbon loops can be closed by re-using the products themselves, mechanical recycling, chemical recycling for purposes of feedstock re-use as well as incineration of waste, which allows for energy recovery, capturing of CO_2 and a re-use of the carbon as a chemical feedstock. Under favorable conditions, carbon resources could be recovered from plastic waste and sludge. In this respect, the chemical versatility of carbon allows for a number of different carbon cycles to contribute to a GHG neutral, circular economy.[1]

The current technological possibilities to reduce GHG emissions in chemical production processes can be narrowed down in four categories: 1) *Energy efficiency potentials*, 2) *Electrification of existing industrial processes*, 3) *Hydrogen and* CO_2 *-based production routes*, and 4) *Use* of *biomass and alternative low-carbon feedstock*. Nonetheless, it should be kept in mind that such categories are of a non-exhaustive nature and that there are several promising routes emerging with a low carbon footprint that could potentially open up new reduction potentials as technologies grow more mature.[2]

The large-scale implementation of the technology routes mentioned would allow for a very significant reduction of CO_2 emissions. According to the Dechema study (2017), the abatement potential of the European chemical industry amounts up to a 59% reduction by 2050, subject to the strict conditions listed in the intermediate scenario. Whereas the reduction potential through further incremental energy efficiency improvements is deemed to become smaller within the entire industry, the other options

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[1] For more information on of carbon cycle management, see: “*Kreisläufe für Kohlenstoff*”, VCI 2018.

[2] For a more detailed assessment of the available technological GHG reduction pathways in the European chemical industry, see: *“Low carbon energy and feedstock for the European chemical industry*”, Dechema 2017.

could unlock a significant transformation towards a low-carbon production. The use of low-carbon hydrogen as a feedstock for further chemical production, e.g. produced through electrolysis with renewable energy or methane pyrolysis, seems especially promising as well as for becoming a major energy carrier next to electricity.

Assessing framework conditions for large-scale emission reductions

Technological feasibility is an essential, however, not the sole factor to be taken into account when estimating long-term emission reduction potentials. For example, depending on the specific production process, technological progress and location of the value chain, there is a broad range of other variables determining the cost-efficiency of these pathways. In return, this inevitably impacts the ability of businesses to make long-term investments in low-carbon production routes.

There are thus several technical and economic circumstances to be considered more carefully when determining the viability of low-carbon production routes in the chemical industry and that need to be brought to the forefront of EU policy planning:

- **Economic gap:** From a purely business point of view and under current conditions, none of the technological options available offer an economic incentive to make a low-carbon switch. Rather, companies that were to implement low-carbon production routes would face significantly higher operational costs. In particular commodity and globally traded chemicals would be encountering increasing competitiveness challenges, finding themselves at a cost disadvantage in comparison to other global producers. Moreover, the repercussion of a deteriorating cost competitiveness would also be visible in other supply and industrials sectors, since such primary or intermediate chemicals are often located at the beginning of value chains. However, it is not only global competition that challenges the economic feasibility of many low-carbon pathways: Also the short-term nature of financial markets and shareholders' expectations on publicly traded companies limit the ability to invest in risky projects without having a business case or market secured for the long-term.

- **Price and availability of renewable energy**: Switching from conventional and fossil-based to low-carbon production, including electrification and the use of alternative feedstocks, results in most cases in a significant increase of final energy consumption. With a rapidly growing demand for renewable electricity in particular, the viability and total costs of low-carbon production will be determined by the availability and price of renewable energy to an even larger extent than before. For example, forecasts by the Dechema study (2017) estimate that the European chemical industry would alone require between 30-55% (960-1900 TWh) of anticipated renewable electricity capacities in Europe by 2050 in order to achieve a GHG reduction by more than half (>50%).[3] Nevertheless, guaranteeing access

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[3] In more ambitious scenarios and when including the production of synthetic fuels, the need for renewable electricity (< 350%) as well as for CO_2 feedstock (110-670 Mt.) increases significantly.

alone is not enough. In order to give proper economic incentives for large-scale electrification processes, current prices would not only have to fall in absolute terms, but also decrease relatively to the price of fossil fuels.

- **Reducing process emission**: A large part of emissions in the chemical industry emerge from the processing of carbon feedstocks, meaning that they cannot be abated through a simple switch from fossil to renewable energy sources. The reduction of such process emissions is only possible by either re-using the CO_2 for other platform chemicals, switching to alternative feedstock or by radically changing production processes. At the moment these gaps can only be filled by major innovative and technological breakthroughs which are yet to be implemented on a large-scale. On the other hand, such efforts require major investments by companies and are unlikely to materialise as long as business cases remain uncertain and technologies still show low maturity.
- **Investment and retrofitting costs**: There are significant long-term investments that need to be made in the next years in order to pave the way for ambitious GHG reductions. The additional investment costs of the European chemical industry for implementing low-carbon measures have been calculated in the Dechema study (2017) to amount up to 17–27 billion € / per year, depending on the respective reduction scenario. However, because industrial production plants typically have lifetimes close to 50 years, investments in new installations will likely not follow without a secure business vision going beyond 2050. From this perspective, continuous repairs, rebuilds and improvements on existing equipment seem more likely. Another important aspect relates to the deep integration of modern and efficient industrial sites: Any change to one part of the process will likely have repercussions to other parts of the production chain, potentially triggering more measures in the downstream installation infrastructure. For example, the electrification of an ethylene steam cracking furnace would eliminate some of the excess heat that is used later in the integrated site production. This could further complicate cost calculation for reliable investments and deteriorate the overall financial prospects of investing in retrofitting measures.

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VCI represents the politico-economic interests of around 1,700 German chemical companies and German subsidiaries of foreign businesses. For this purpose, the VCI is in contact with politicians, public authorities, other industries, science and media. The VCI stands for more than 90 percent of the chemical industry in Germany. In 2017, the German chemical industry realised sales of over 195 billion euros and employed some 453,000 staff.