Protecting the climate and securing competitiveness together: how the gas sector and industry help achieve that

Thanks to its transport and storage capabilities and role as a driver of innovation in the energy transition, gas and its infrastructure play an important role in securing Germany's position as an industrial and business location.

The use of gas and gas infrastructure secures jobs now and in the future, and must be considered across entire value-added chains.

The energy mix of the future consists of renewable electricity and gas, which will become increasingly green over time.

Climate targets for Germany have been set. Both industrial and gas companies as well as the associations representing them have identified solutions as to how these sectors can make their contribution. There are ideas for new production processes and proposals to increasingly use hydrogen and methane from renewable sources for a secure and sustainable energy supply. In this position paper, the signatory gas companies and the industrial associations advocate that in the ongoing debate about energy policy, we should not lose sight of the goal "securing Germany as a business location." This is a declared goal of the Federal Government, as a glance at the coalition agreement shows:

> "[…] climate and environmental friendliness, supply security and affordability are the cornerstones of this energy policy. Safeguarding the competitiveness of our country as a place to do business is vital so that the energy transition succeeds […]." (coalition agreement, line 6464)

The climate targets for Germany have been set. The contribution industrial and gas companies can make in achieving them is presented here as part of proposed solutions. There are ideas for new production methods and proposals for successively using hydrogen and methane from renewable sources to deliver a reliable, climate-friendly energy supply.

In this position paper, the signatory gas companies and industry associations advocate that the goal of "safeguarding Germany as a place to do business" should not be neglected as the energy policy debate evolves.

We show

- why industry and the manufacturing sector are of such exceptional importance in international competition, especially for Germany, and reiterate
- why gases and the existing natural gas infrastructure are, now and down the road, part of the solution to ensure – also through greater sector coupling – that the climate targets are achieved and that a secure supply of energy and competitiveness of Germany as a business location are safeguarded.

What we want: A climate and energy policy that reduces emissions effectively, coupled with an industry policy that preserves competitiveness.

What we do: We, the gas companies and the companies in gas-intensive industry, think in terms of both climate protection and competitiveness. And we make an active contribution to maintaining the balance between more climate protection and securing international competitiveness.

Ensuring value creation

> "Germany has a strong and efficient industry that accounts for 24 percent of gross value added." (coalition agreement, line 2536)

Ensuring prosperity moving ahead and preserving the German economy's structure of small and medium-sized enterprises means keeping value creation in Germany. Total gross value added in industry and the production sector in Germany is high and need not shirk comparison internationally: the production sector in Germany accounts for 27.5 percent of gross value added (including the construction industry's 4.5 percent), higher than the figure in other industrialised countries, such as France and the United States (19.6 and 20.0 percent respectively).[1]

A major factor underpinning this value creation in Germany is the use of gas as a fuel. Gas consumption in Germany's industrial and construction sectors is around 45 percent higher than in France and even 80 percent higher than in Poland, for example.[2]

Value creation in German is now more energy-efficient in Germany than in most other industrialised countries thanks to gas and its existing infrastructures.

Energy consumption per unit of output has been declining for years as a result of increases in energy efficiency. Just 4.7 gigajoules (GJ) of primary energy were used to produce goods and services worth €1,000 in Germany in 2016. Energy efficiency in the economy as a whole has improved by 23 percent since the year 2000 (6.1 GJ).[3] Greenhouses gas emissions due to industrial processes fell by more than 20 percent between 1995 and 2018.[4]

The German economy boasts impressive energy efficiency compared to other industrialised countries: France, for example, uses more energy per $1,000 of gross domestic product.[5] Germany's overall energy productivity is also roughly one-third better than that of the United States. Germany's ratio of GDP to gross inland energy consumption is even around four percent better than Japan's.

Safeguarding Germany's competitiveness and the good energy efficiency of its industrial enterprises – due in part to the use of gas as a fuel – are good arguments for including gas and its infrastructures in the concept for the country's energy transition. That also includes a reliable energy and climate policy framework and effective prevention of carbon leakage in order to avoid shifting CO_2 emissions and jobs elsewhere.

Example: the chemical industry's closed-loop value chain

> "We aim to preserve and expand Germany's existing closed-loop value chains – from the energy-intensive primary industry to the manufacture of high-tech products […]." (coalition agreement, lines 2541 to 2543)

In 2016, industrial companies consumed a total of just under 40 percent of Germany's total natural gas requirements (926 billion kWh). Around 90 billion kWh of natural gas are currently consumed solely as energy in the chemical industry – about 10 percent of total gas consumption in Germany. Approximately 35 billion kWh are additionally used as feedstock. That means around 14 percent of the natural gas consumed in Germany is used as energy and feedstock in the chemical industry.[6]

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1 German Federal Statistical Office 2018; figures for Germany from 2017 and France from 2016. Those of the U.S. are from 2015.
2 factfish, based on UN data; figures for 2015.
3 AG-Energiebilanzen (German Working Group on Energy Balances), provisional figures at December 2017
4 German Federal Environmental Agency, January 2018
5 https://data.worldbank.org/indicator/EG.USE.COMM.GD.PP.KD
6 Source: Destatis, German Chemical Industry Association (VCI)

One of the uses of gas as a feedstock is for generating synthesis gas from its main constituent methane and processing that further into ammonia and methanol. Natural gas is also used in the production of acetylene and hydrocyanic acid. These basic chemicals are the foundation for several value chains – from polymer materials, detergents and cleaning agents, to special chemicals.

The chemical industry also generates 17 TWh of electricity, mainly in highly efficient, natural gas-fuelled CHP (combined heat and power) plants. This saves resources and reduces CO_2 emissions. Future investments in CHP technologies require stable and adequate conditions for funding and incentivising them. The future framing of the German Combined Heat and Power Generation Act (KWKG) should address that.

The closed-loop value chain needs gas – as a source of energy and a raw material.

Example: value-adding processes in the steel industry

> "[…we aim to] launch a support programme aimed at decarbonisation of energy-intensive industries, such as the steel and cement industries, together with cabinet colleagues from the Ministry for Economic Affairs and Ministry for Research." (Svenja Schulze, Federal Minister for the Environment, April 2018)[7]

So that primary steelmaking, in which iron ore is processed, can be decarbonised as far as possible, the coal-based blast furnace route that currently predominates worldwide must be replaced by direct reduction processes where hydrogen produced with low greenhouse gas emissions can be used to reduce the iron ore. This method is also far preferable in terms of efficiency of CO_2 avoidance compared with other decarbonisation approaches: CO_2 reductions of 0.5 to 0.6 tonnes per MWh of electrical energy used are achieved. The fact that suitable direct reduction processes can also be operated with low CO_2 emissions using natural gas and any mixture of natural gas and hydrogen makes them a particularly valuable and future-proof component in establishing a hydrogen economy.

Gaseous reducing agents will gain greatly in importance in the steel sector in the future, since current carbon-based resources have to be almost completely replaced so that the climate targets can be achieved. Based on the current use of coal in integrated steel mills, that would correspond to a gas equivalent of approximately 460 PJ per annum. That requires all the technology used in crude steel production to be converted to climate-neutral processes, which entails huge investments. However, that is the only way to ensure customers of the steel industry in the deep value chains, such as mechanical and plant engineering and the automotive industry, can move toward sustainable production.

Gas is now an indispensable fuel in steel processing (including in reheating and forging furnaces). However, leveraging the existing potential to enhance efficiency in this area will not be enough to deliver the contribution needed so that the ambitious climate protection targets for 2050 can be achieved. Apart from the possibility of direct electrification to supply some of the heating, a substantial application area for synthetic methane or hydrogen produced with low greenhouse gas emissions is emerging here. **The availability of gas is vital to decarbonising the steel industry. Converting crude steel production to direct reduction can make a valuable contribution to scaling up of hydrogen applications.**

7 To rp-online, 6 April 2018.

Safeguarding jobs

> "We aim to strengthen the competitiveness of the EU and its growth forces in the context of globalisation so as to safeguard future-proof jobs and create new ones in the EU: that is the foundation of our future prosperity." (coalition agreement, line 141)

German industrial enterprises boast suitable means of production that enable them to respond flexibly to consumer demand. That fosters innovation and enables the domestic product range to be developed further. As a key source of energy, gas helps power industry, but is of course used as a means of production.

Germany only ranks mid-table internationally in terms of gross fixed capital formation. Specifically, the gross fixed assets of the country's energy-intensive companies have declined by 8.5 percent since 2010[8]. A further decline would weaken competitiveness and so result in job losses. A political strategy that continues to rely on gas and its infrastructures would instead bolster the future potential of these sectors of industry and so deliver stable jobs for future generations. We therefore welcome the fact that the Federal Ministry for Economic Affairs has taken this issue up in its initial paper appraising the Gas 2030 dialogue process, and also wants to consider it in the national hydrogen strategy.

Future technologies and innovation policy

> "We are committed to industry: strategic industrial and innovation policy." (coalition agreement, line 399)

The real-world laboratories of the energy transition are a key part of the German government's research and innovation policy. The gas sector and industry are involved in many projects in which gases and infrastructures with a viable future are being tested and applied in practice. In the "Westküste 100" real-world laboratory, for example, renewable hydrogen is to be produced from offshore wind energy by a 35 MW electrolyser[9], while also using the waste heat generated in the process. The hydrogen can be used to produce climate-friendly aviation fuels and can also be fed into the gas network of Heide's municipal utility. Unavoidable CO_2 from regional cement production is used to make fuel without the need for fossil fuels. What makes this real-world lab project so special and innovative is this intermeshing of different material cycles within an existing regional infrastructure. The material cycles will be connected via a new – to be constructed – hydrogen network, including connections to a salt cavern storage facility. Production, transportation, storage and commercial use of renewable hydrogen on an industrial scale is to be investigated at the real-world lab at Bad Lauchstädt Energy Park in the Middle German Chemical Triangle, for example. Renewable hydrogen is to be produced with a large electrolysis plant with a capacity of up to 35 MW using renewable electricity, stored temporarily in a specially equipped salt cavern, and fed into the hydrogen network of the chemical industry based in Central Germany through a repurposed gas pipeline. Hydrogen can also be used for urban mobility solutions moving ahead.

Industry associations and the gas sector, i.e. the German Technical and Scientific Association for Gas and Water (DVGW), are in close dialogue aimed at finding answers to unresolved questions, such as the challenges posed by future changes to gas properties as a result of hydrogen admixtures in gas networks.

In the future, too, energy that is as low in CO_2 emissions as possible will be required in numerous innovative fields. Thanks to their transport and storage capabilities and role as drivers of innovation, gas and its infrastructure play an important role in securing Germany's position as a place to do business, now and in the future. For example, methane pyrolysis will enable hydrogen to be produced with low greenhouse gas emissions, even if the fossil fuel

8 https://www.iwkoeln.de/fileadmin/user_upload/Studien/Kurzberichte/PDF/2019/IW-Kurzbericht_2019__Kapitalstock.pdf
9 Potentially up to 700 MW in the future

natural gas is used, since the carbon introduced with the natural gas is recovered as a solid in this process. If biogas is used as the precursor instead of natural gas, methane pyrolysis can even act as a greenhouse gas sink. The method is currently in the development stage.

It is important to think in a technology-neutral way. The study by enervis "Climate protection through sector coupling" and German energy agency dena's pilot study "Integrated energy transition" have also made it clear that sector coupling with renewable and decarbonised gases also enable costs to be cut compared to technological approaches that are more electricity-based. Hydrogen is therefore gaining in importance as a fuel: it is the key element in climate-neutral steelmaking and a broad range of applications in chemical and other industrial processes. Using hydrogen – like synthetic fuels – for energy is also an additional attractive option. In this context, the use of decarbonised gases, in conjunction with CCU and CCS technology, will also be an option for industry in the future.[10]

The gas industry is accompanying and driving technical innovations: in 2018, a team of researchers from the Karlsruhe Institute of Technology and the Institute for Advanced Sustainability Studies in Potsdam captured the Innovation Award of the German Gas Industry in the category "Research & Development" for a method of carbon-free production of hydrogen using a bubble column reactor.[11]

The above examples demonstrate that (natural) gas and its already existing infrastructures are vital elements in ensuring supply security for the business and industrial location Germany in the short, medium and long term.[12] That is proven by recent studies showing that gas-fired power plants are the most cost-effective option to cater for the future increases in demand for reliable capacities.[13] The enormous storage capacities of gas networks, widely diversified import sources and transport routes, and liquid trading markets not only increase the resilience of the energy supply in all areas of industry, even during "dark doldrums" – times of no or very low solar and wind power production. In conjunction with innovative technologies (power-to-X), the use of (natural) gas and its infrastructures will also enable further increases in efficiency moving ahead, for example in the development of innovative production methods.

Within the context of the current energy policy objectives, renewable energies in conjunction with gas create an energy mix that not only minimises emissions in supplying the production sector with electricity and heat, but also – a very crucial aspect – offers production reliability. That helps protect industrial value chains and ensure that unnecessary emissions are not exported to countries with poorer energy efficiency.

"Successful economy for the prosperity of tomorrow" (coalition agreement, line 393)

The undersigned companies from the gas and gas-consuming industries offer their services as actively involved partners for political dialogue. Because we identify with the objectives of the Federal Government to secure Germany's position as a place to do business.

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10 enervis study "Climate protection through sector coupling: options, scenarios, costs" (2017)
11 The initiators of the Innovation Award of the German Gas Industry are ASUE, BDEW, DVGW and Zukunft ERDGAS.
12 Dedicated hydrogen infrastructures flanking the gas network might also help supply the primary industry in future with hydrogen produced with low greenhouse gas emissions
13 Final report of the dena pilot study, 2018, page 29.