



# German industrial gas: Crisis averted, for now

## Introduction

As Europe's largest industrial economy, Germany was heavily exposed to the 2022 Russian gas shut-off.<sup>1</sup> But having weathered the storm without any supply shortfall since the start of the Ukraine crisis, the German gas market outlook for winter 2023/24 is more certain, even though the macro environment has darkened, with GDP in a shallow contraction since Q4/2022.<sup>2</sup>

The availability of imported liquefied natural gas (LNG) through three new terminals, high autumn storage levels, and the expectation that German industrial demand will be lower than winter 2022/23 means that price risk, rather than supply risk, is uppermost. A long, colder-than-normal winter presents the immediate price risk looking forward, since Russian supply is no longer in doubt as it was last year. But despite higher gas prices in 2022, demand side regulation and alternative supply allowed most German industrial gas users, whether for energy, heat, or feedstock, to survive the crisis.

For Germany, the events in 2022 underlined the role that moderately priced Russian imported gas had played in sustaining German industry despite the growing list of headwinds, including less competitive labour, heavy environmental regulation, and other governmental red tape. The move by some German industries to shift operations outside the country was already under way, but was given additional impetus by the gas crisis.

This paper looks at Germany's unique position as the continent's largest gas consumer and its emerging role as an import and transportation hub—both north–south and west–east. German industrial gas demand is also significantly higher as a proportion of total demand, at 35 per cent pre-crisis compared to an average 20 per cent in the European Union (EU).<sup>3</sup> This paper surveys the mixed impacts that the gas price rally had on German industries, particularly in chemicals. It explains the different strategies seen among the corporates in this sector. It focuses special attention on BASF as a case study—the largest chemical company in Europe, and one that was heavily invested in Russian joint ventures as well as its international portfolio in the USA and Asia.

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<sup>1</sup> In 2021, Gazprom supplied more than 50 per cent of German gas consumption (around 50 Bcm). Gazprom's total gas deliveries, including transit gas and volumes destined for re-export, accounted for around 80 Bcm. See data provided by Bundesnetzagentur (2023a); for more details see Henderson and Chyong (2023).

<sup>2</sup> GDP in Q4/2022 declined by –0.4 per cent compared to Q3/2022, followed by –0.1 per cent in Q1/2023 and 0 per cent in Q2/2023. For 2023 in total, growth forecast by the official advisory council of the German Government (Sachverständigenrat) was +0.2 per cent as published in March 2023. However, several other institutions have a more pessimistic view, e.g. Bundesbank (–0.5 per cent). With respect to 2024, the official forecast is set to +1.3 per cent, which is within range of other publications (between +0.9 and +1.7 per cent). For available GDP forecasts see Statista (2023).

<sup>3</sup> Calculated from BDEW and Eurostat data. In this paper, Europe is defined as the European Union.

## Industrial gas demand in Germany—An overview

### German gas balances in 2022

German gas consumption declined by more than 13 per cent in 2022 compared with 2021 (Table), which is a smaller drop than the target of minus 20 per cent,<sup>4</sup> but in line with the general European trend, which also showed a decline of around 13 per cent.<sup>5</sup> While the industry and district heating sectors cut gas consumption hard, other sectors such as residential and commercial saw less of a decline. The power sector reduced demand slightly less than the overall average, which is somewhat surprising since reduced demand from that sector had been expected to be one of the main levers for demand reduction—something that was realized in other European countries.<sup>6</sup>

Even though the gas demand reduction target was not fully met, no supply interruptions or cut-offs to end-users took place in 2022. Alongside a slight increase in net imports, storage withdrawals contributed much more to supply than in 2021. This was due in part to the expropriation of the Rehden storage site by energy regulator Bundesnetzagentur (and later by state-owned company SEFE). Former owner Gazprom Germania intentionally limited storage fills in summer 2021—which meant that more than 5 Bcm of capacity at the site was inaccessible. After German state intervention (April 2022), the Rehden storage was rapidly filled in summer 2022.<sup>7</sup>

**Table 1: German gas balances 2021–2022 (Bcm)<sup>8</sup>**

|           | Parameter                                   | Gas balance (Bcm) |       | Change (%) |
|-----------|---|-------------------|-------|------------|
|           |   | 2022              | 2021  |            |
|           | Imports (including transit)                 | 133.5             | 154.9 | –14        |
| –         | Exports (including transit)                 | 47.7              | 71.2  | –33        |
| =         | Net imports                                 | 85.8              | 83.7  | +3         |
| +         | Domestic production                         | 4.4               | 4.6   | –4         |
| +         | Storage balance                             | 8.7               | 5.6   | +55        |
| –         | Statistical difference                      | 0.9               | 1.6   | –44        |
| =         | Total gas consumption                       | 80.6              | 92.5  | –13        |
| of which: | Industry                                    | 28.1              | 34.3  | –18        |
|           | Households                                  | 25.5              | 28.7  | –11        |
|           | Powerplants                                 | 9.9               | 11.2  | –12        |
|           | District heating                            | 5.5               | 6.6   | –17        |
|           | Other sectors (commercial, transport, etc.) | 11.5              | 12.1  | –5         |

Source: Author's calculations based on BDEW (2023b)

### Industrial gas demand—efficiency gains

As noted above, German industry has reduced its gas consumption significantly since 2021 without any notable curtailment of industrial production, a reduction that needs to be placed in a broader context.

When comparing the industrial sector's energy supply mix in 2010 and 2021, not much changed over the period. Total industrial energy consumption fell by just 4 per cent even while industrial production increased by 40 per cent. Nevertheless, despite efficiency improvements, absolute gas import

<sup>4</sup> The 20 per cent target was not directly implemented by law. It was instead a directive of minister Robert Habeck to the voluntary 15 per cent reduction target of the EU, considering the fact that Germany had the highest share of Russian gas supplies to the EU. See BMWK (2022a).

<sup>5</sup> See Honoré (2023).

<sup>6</sup> A combined nuclear, lignite, and hard coal phase-out together with a somehow deferred renewable expansion might be a reasonable explanation for this development.

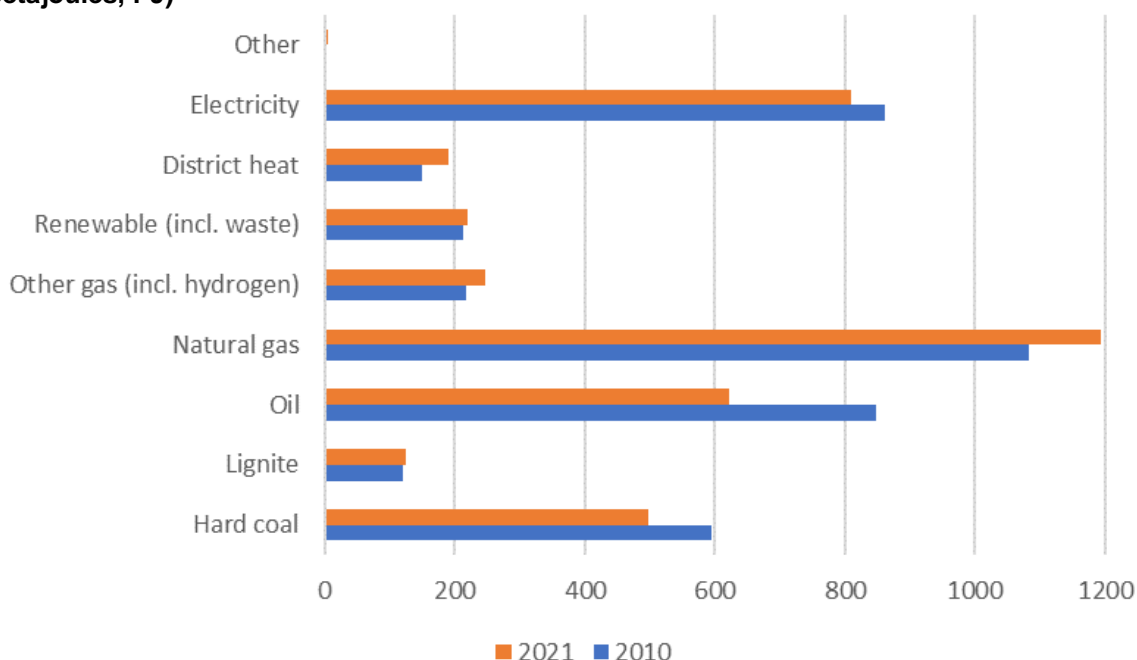
<sup>7</sup> See Seeliger (2022), p. 10.

<sup>8</sup> According to official figures from the German Ministry of Economic Affairs and Climate Policy, we use 10.8 kWh per cubic metre as the conversion factor in this paper (see BMWK, 2022b, p. 2).

dependency remained steady, which also meant that greenhouse gas emissions could not be cut as needed.<sup>9</sup>

Figure compares the industrial consumption of various sources of energy in 2010 and 2021 (no detailed data are yet available for 2022). On one hand, industry cut its use of oil (–27 per cent), hard coal (–16 per cent), and electricity (–6 per cent); but on the other hand this was replaced by natural gas (+10 per cent) and district heating<sup>10</sup> (+27 per cent). Renewables contributed a limited amount with only minor increases observable within the period.

**Figure 1: Energy consumption of German industry by energy source in 2010 and 2021 (petajoules, PJ)**



Source: Author's calculations based on data from Statistisches Bundesamt (<https://www-genesis.destatis.de/genesis/online>)

Within the industrial sector, gas consumption is dominated by chemical industry (accounting for 37 per cent), followed by food (11 per cent), metal (10 per cent), glass/rocks/minerals (9 per cent), and paper (8 per cent).<sup>11</sup>

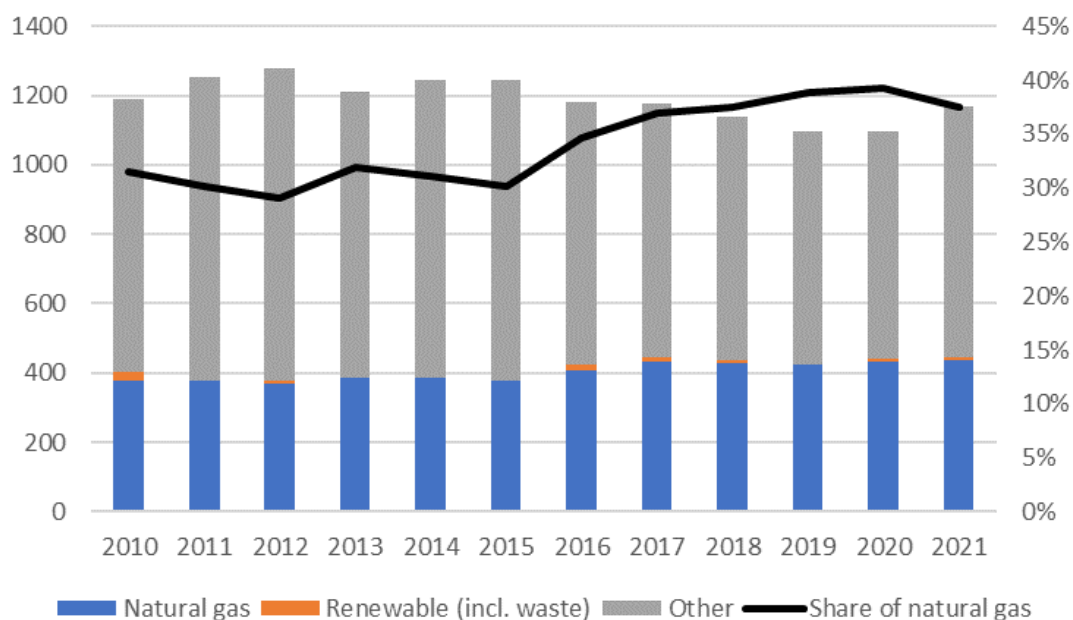
Figure illustrates the energy consumption of the chemical industry, highlighting gas and renewables. When comparing 2010 and 2021, the chemical sector is more or less in line with the general development of the industry sector, showing a minor decrease in total energy consumption but an increase in natural gas. Although the role of renewable energy in the industrial sector is limited, it is negligible in the chemical sector at only 1 per cent in 2021, down from 2010 (3 per cent). Finally, the importance of natural gas for the chemical sector is higher than for the industrial sector (37 compared to 31 per cent), making this sector particularly at risk from gas supply constraints and/or high gas prices. As for industry in total, the share of gas on total energy consumption increased significantly between 2010 and 2021 (from 32 to 37 per cent in the chemical sector, and from 27 to 31 per cent in the industrial sector).

<sup>9</sup> All data from Statistisches Bundesamt [Federal Statistical Office of Germany], <https://www-genesis.destatis.de/genesis/online>.

<sup>10</sup> District heating in Germany is generated mainly by natural gas (43 per cent) and coal (20 per cent). Renewable sources contribute only around 19 per cent (BDEW, 2023a).

<sup>11</sup> Statistisches Bundesamt (2022).

**Figure 2: Energy consumption of German chemical industry from 2008 to 2021 (in exajoules, EJ)**



Source: Author's calculations based on data from Statistisches Bundesamt (<https://www-genesis.destatis.de/genesis/online>)

## German industry—Mixed responses in 2023

According to statistics and other available sources, German industry managed to avoid any physical curtailment with respect to gas supply during last winter. In this section we analyse the sectoral situation and include a brief case study of BASF, the world's leading chemical company.

In terms of methodology, the analysis is based on public available resources such as press releases, journal articles, and annual reports of companies listed on the stock exchange. Given only very limited information in such documents, additional interviews have been carried out with some industry representatives (large companies, SMEs, industry federations and associations) as well as public authorities. The interviews were informal and all information was not attributed. While those interviews do not meet academic standards, they do offer some anecdotal evidence.<sup>12</sup>

### Supply interruptions

Despite warnings from German politicians that gas supply shortages were likely during winter 2022/23, there were no physical interruptions, an outcome that is backed by statements from German authorities and supported by an analysis of company reports and interviews. While gas as a direct input parameter, either for power or heat generation or as direct feedstock, was not disrupted, some companies reported they had physical issues in the procurement of some "gas-related" products.<sup>13</sup>

### Price effects

Even while no physical interruptions occurred (which was one of the main concerns of many market participants and the German Government), natural gas prices remained a top concern for many German companies. When assessing corporate concerns, two prefilters were performed. First, we considered only companies in the DAX (the stock market index containing the largest 40 companies) and MDAX (the index for the next 50 most capitalized companies below the DAX) exclusively or mainly allocated

<sup>12</sup> In total, six interviews have been carried out, most with sector-specific industry associations.

<sup>13</sup> E.g. Evonik (2023), p. 101. Evonik did not explain which products were impacted, but most likely ammonia and other basic chemicals are included in that category.

to the top gas-consuming sectors: chemical, food, metal, materials (glass/rocks/mineral), and paper. And second, all latest available annual or financial reports of those companies were searched for the terms “natural gas” and “energy prices”.<sup>14</sup>

In total, 12 companies were seen to be mainly afflicted by the gas crisis, of which nine belong exclusively or in large part to the chemical sector: BASF, Bayer, Henkel, Merck (DAX); and Covestro, Evonik, Fuchs Petrolub, Lanxess, Wacker (MDAX). Heidelberg Materials (DAX) is allocated to the materials sector as well as K+S (MDAX), while ThyssenKrupp (MDAX) is the only representative of the metal industry. Finally, no companies of the food and paper sectors are listed in either stock market index.

When looking at the frequency (and by this presumably also importance) of energy prices in the annual reports, some huge differences appeared. Whereas some reports mentioned the term “energy prices” only a few times [such as Bayer (1), Fuchs Petrolub (1), and K+S (4)], other reports are filled with sections on this topic [such as Lanxess (32), BASF (29), and Wacker (27)]. To put those figures into context: Germany’s only two energy majors on the stock market mentioned “energy prices” less than the latter three chemical companies [E.ON (25), RWE (6)]—which is somehow unexpected. The query for the terms “natural gas” also showed disparities. Some companies had many entries [K+S (32), BASF (27), Evonik (25)] and others only very limited [Henkel (1), Fuchs Petrolub (3)]. At least in this search category, the energy companies reached higher hits [RWE (45), E.ON (38)]. Table summarizes the results of the two prefilter queries.

**Table 2: Results of prefilter queries**

| Company              | Main sector | Stock index | Query           |               |
|----------------------|-------------|-------------|-----------------|---------------|
|                      |             |             | “energy prices” | “natural gas” |
| BASF                 | Chemical    | DAX         | 29              | 27            |
| Bayer                | Chemical    | DAX         | 1               | 5             |
| Covestro             | Chemical    | DAX         | 11              | 3             |
| E.ON                 | Energy      | DAX         | 25              | 38            |
| Evonik               | Chemical    | MDAX        | 16              | 25            |
| Fuchs Petrolub       | Chemical    | MDAX        | 1               | 3             |
| Heidelberg Materials | Materials   | DAX         | 14              | 3             |
| Henkel               | Chemical    | DAX         | 7               | 1             |
| K+S                  | Materials   | MDAX        | 4               | 32            |
| Lanxess              | Chemical    | MDAX        | 32              | 3             |
| Merck                | Chemical    | DAX         | 0               | 3             |
| RWE                  | Energy      | DAX         | 6               | 45            |
| ThyssenKrupp         | Metal       | MDAX        | 8               | 9             |
| Wacker               | Chemical    | MDAX        | 27              | 23            |

Source: Annual reports

While such queries offer only limited insights, some initial findings can be established. First, some gas-intensive sectors have been affected more than others. The chemical sector, one of Germany’s most important industrial sectors, was hardest hit, but even here there are significant differences. Some chemical companies reported limited impacts, while others expressed strong concerns in their reports about gas market developments. These companies explained their strategy towards the gas challenge as follows.

- Lanxess said it was able to fully pass energy price increases to its customers, as did Evonik. Both increased profits, as sales price increases more than compensated for energy price hikes.<sup>15</sup>

<sup>14</sup> German versions were searched with the terms “Erdgas” and “Energiepreise”. The term “gas” was also examined, but this one was clearly dominated by text sections on greenhouse gases. Nevertheless, in some cases, companies used the simple term gas for natural gas (or used both). Therefore, the search query for natural gas might underestimate the actual frequency and importance.

<sup>15</sup> Lanxess (2023a), p. 117; Evonik (2023), p. 101.

- Merck and Bayer said there had been almost no impact on financial results. Bayer noted that energy costs accounted for less than 3 per cent of total cost.<sup>16</sup>
- Covestro reported a mixed picture. For some product divisions (e.g., Solutions and Specialities) increased energy prices were passed on to sales prices. In other segments (e.g., Performance Materials), the company was not able to fully compensate the energy price increase with sales price adjustments.<sup>17</sup>
- BASF was the only company that reported substantial declines in chemical production due to gas market developments. Additionally, BASF was the most pessimistic company concerning the future gas market outlook.<sup>18</sup> Given that BASF is the largest chemical company in the world and also has very strong connections to the gas market (Russia especially), we will take a closer look at this company in the next section.

The evidence suggests that effects vary not only by sector or company, but also between different processes or products within each company. Depending on the impact of the specific process or product, on a macro level, comparable companies such as BASF and Bayer experienced the gas price increases differently.<sup>19</sup> The ability of companies to replace gas in their processes or raise sales prices (which relates to customers' price elasticity of demand) were key parameters. Companies with more base products, such as BASF, appeared to be more challenged than companies producing specialized chemicals, such as Lanxess.<sup>20</sup> The evidence so far comes from analyses from large listed companies with extended reporting commitments. However, most German companies in the industrial sector are SMEs. Interviews with SME officials backed up the findings from the exchange-listed companies, but also highlighted differences, as follows.

- All contacts with SMEs, associations or related authorities confirmed that there was no physical interruption of gas supply.
- Most smaller companies used long-term gas procurement strategies. Whereas large-scale companies usually buy gas directly at energy exchanges, or have contracts with trading companies related to exchange prices, most smaller companies have long-term relationships, commonly with local suppliers. Several companies and associations said they had experienced no price effects in 2022, as they held fixed-price contracts valid until the end of the year or beyond. In some cases, contracts expired before, but many local suppliers offered new contracts with only moderate price increases as local suppliers wanted to retain industrial customers in their sales portfolio (in order to smooth seasonal gas demand curve or because of long-term take-or-pay procurement contracts they have to fulfil themselves).
- On the production side, no clear picture could be drawn. Some processes had been reduced due to price effects, but that seems not to be the majority. In contrast, some said that they even increased production in 2022 and put produced goods into stocks—as price increases were expected for the future and therefore production could be front-loaded.

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<sup>16</sup> Merck (2023), p. 254; Bayer (2023), p. 144.

<sup>17</sup> Covestro (2023), pp. 143 ff.

<sup>18</sup> See BASF (2023a), pp. 154 ff.

<sup>19</sup> According to VCI (Association of Chemical Industry), polymers (–10 per cent sales in 2022 YOY), basic chemical products (–11 per cent) and petrochemicals (–17 per cent) were hit hardest. Other products saw only minor decreases or even higher sales (such as pharmaceuticals, +5 per cent). For the chemical industry in total, sales volumes declined by 7 per cent, whereas sales prices increased by 22 per cent. This led to an increase in revenues of 17 per cent and, somehow remarkable in such a crisis situation, a surplus of employees by 0.5 per cent (see VCI, 2023).

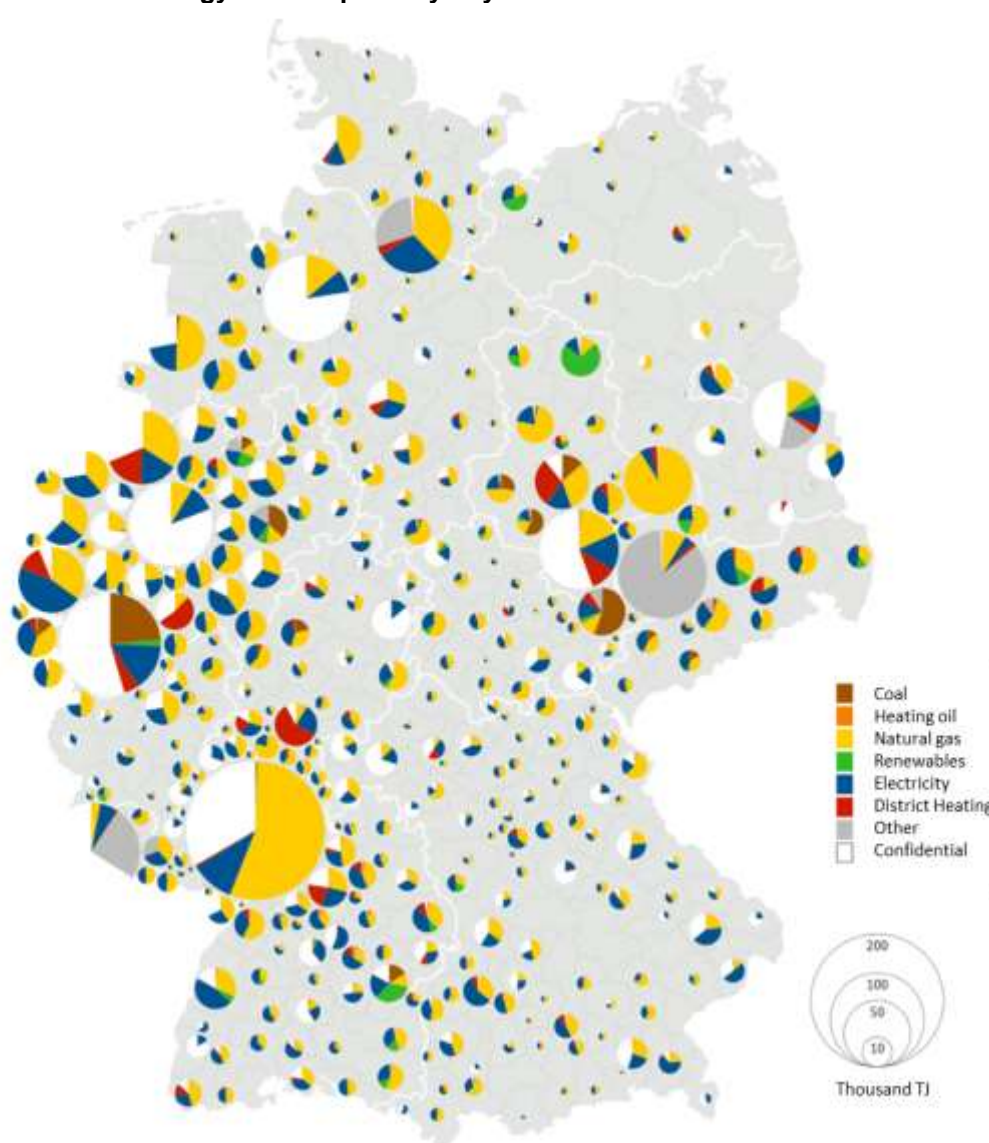
<sup>20</sup> However, economic slowdown, and especially a worldwide decline in demand for chemical products in the first half of 2023, also seems to hit some of the companies which remained profitable in 2022. For example, Lanxess released a pessimistic outlook for 2023 including an announcement of some job cuts. Most of these job reductions are planned for Germany, but mainly in administration and not in the production section (Lanxess, 2023b).

### A closer look at BASF

BASF is the largest chemical company in the world by revenue (around €87 billion) with more than 110,000 employees.<sup>21</sup> The company is based in Ludwigshafen in south-western Germany, with production sites located in Germany (five locations), Europe (Belgium, Switzerland), North America (USA, Mexico) and Asia (China, Malaysia). BASF is subdivided into six business segments (chemicals, materials, industrial solutions, surface technologies, nutrition & care, and agriculture solutions).

The gas consumption of all BASF sites in Europe was around 3 Bcm (32 TWh) in 2022, of which Ludwigshafen alone accounted for 2.2 Bcm (24 TWh). The importance of Ludwigshafen as a gas consuming centre is shown in Figure. This graph illustrates energy consumption by city or district with the share of gas highlighted in yellow: Ludwigshafen is the largest demand centre in Germany, located in the south-west.

**Figure 3: Industrial energy consumption by city or district**



Source: Statistisches Bundesamt (2021)

<sup>21</sup> All data and information in this section, unless otherwise cited, derived from BASF (2023a) and <https://www.basf.com/global/en.html>.

The total energy consumption of all BASF sites worldwide was 53 TWh in 2022, which is a decline of around 10 per cent compared to the year before. No exact share for gas is given from the total energy consumption, but there are breakdowns for electricity and steam production. This accounted for 33.7 TWh in 2022, of which 77 per cent (26.1 TWh or 2.4 Bcm) was generated by gas. In 2021, the total input for electricity and steam was 38.5 TWh with a share of 80 per cent (30.9 TWh or 2.9 Bcm).<sup>22</sup>

BASF did not publish total costs for gas or energy, but mentioned that the cost increase from 2021 to 2022 for gas amounted to €2 billion.<sup>23</sup> Compared to total revenues of about €87 billion, or the sales of the chemical segment (€15 billion), gas costs seem to have had a large impact on the company. Given this, BASF reduced its chemical production in Europe by 6 per cent. In Germany, production of basic chemicals was completely stopped, resulting in a total chemical production 12 per cent below 2021. However, as a global player, BASF was able to replace some of these volumes by raising output elsewhere. The USA, South America, Middle East, and Asia all increased output between 2 and 4 per cent. Within Asia, production in China was boosted by 7 per cent, but Japan and Taiwan (–3 per cent and –13 per cent, respectively) suffered decreases. Summarizing these regional results, BASF was still able to increase its global chemical production by more than 2 per cent (but stayed below former increase rates, e.g. 6 per cent in the previous year).<sup>24</sup>

Another factor affecting BASF was its close connection to Russia and Gazprom. BASF had (and still has) a number of joint ventures and cooperation with Gazprom and other Russian companies. The following list summarizes some of the most important joint ventures, as of early 2022 before the Russian invasion of Ukraine.<sup>25</sup>

- Wintershall, a mining and resource company, founded in 1864, was purchased by BASF in 1969 to guarantee access to oil and gas fields. In 2019, the company was merged with DEA to become Wintershall DEA, with BASF holding 72.7 per cent while the remainder is owned by Letter One, a company owned by Russian oligarchs.
- The second largest German gas import company, Wingas, was set up 1993 as a 50:50 joint venture between Wintershall and Gazprom. In 2015, the company was unbundled. Gazprom acquired all gas trading activities, while the transport business was transferred to Gascade, which is owned by WIGA, which in turn is owned 50:50 by Wintershall DEA and Gazprom.
- Further pipeline operating companies (OPAL, NEL) are also owned partly by WIGA.
- Wintershall DEA holds 15.5 per cent of the shares of Nord Stream AG, the owner of Nord Stream 1 pipeline.
- Wintershall DEA is one of the financiers of Nord Stream 2 pipeline, without having any shares (100 per cent Gazprom).
- The company is also active in gas production in Russia. Wintershall DEA holds various minority shares in Gazprom-owned gas fields. As part of the contractual agreement, Wintershall DEA is not allowed to export this gas to Europe, but is forced to sell its gas directly to Gazprom.
- In addition, Wintershall founded a 50:50 upstream joint venture with Lukoil.
- A significant share of BASF's gas demand is covered by Wingas.

After decades of a very profitable cooperation, the Russian war in the Ukraine eroded this Gazprom/BASF joint venture. Gazprom's infrastructure and trading company shares (e.g., WIGA and Wingas) in Germany were transferred to SEFE, a state-owned trustee company. Wintershall DEA's gas activities stayed in operation after the war started, but the company was not able to transfer revenues to Germany. Given this, and presumably massive public pressure, in January 2023 Wintershall DEA

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<sup>22</sup> BASF (2022), p. 128.

<sup>23</sup> BASF (2023a), p. 118.

<sup>24</sup> BASF (2023a), pp. 54f.

<sup>25</sup> All information taken from the websites of the mentioned companies.



decided to disinvest its Russia business.<sup>26</sup> BASF claimed in its annual report that the Russian business had negative impacts on its results of more than €6.5 billion in 2022. BASF had for some time planned to sell shares in Wintershall DEA in an initial public offering, but given the political environment, these plans have been halted.<sup>27</sup>

BASF expects that the environment for the chemical industry will remain tough, especially in Europe. In 2023, another decline in production of more than 5 per cent will occur, with some recovering afterwards (but nevertheless, total growth until 2025 will be negative). This is in contrast to other international operations, where positive growth is forecast. With respect to BASF's revenues, it expects a decline between 0.5 and 4.0 per cent.<sup>28</sup>

As a consequence of this negative outlook, BASF announced large disinvestment plans for Europe and especially Germany. As far as possible, base chemical and ammonia production will be shifted to other production facilities outside Europe. The company announced plans to cut costs by around €500 million per year—of which half will be realized in Ludwigshafen. Given this, the company plans to displace 2,600 employees (two-thirds of this in Germany) and shut down various production facilities.<sup>29</sup>

But it should be emphasized that the massive gas price increase in 2021/22 was only one factor in this disinvestment plan. BASF has pointed to the challenging regulatory framework and negative competitive impact of the EU Green Deal, especially for the chemical industry. Given this, it is no surprise that BASF plans to relocate further parts of its business operations to other, less regulated world regions. This accounts not only for Asia and other developing regions, but also for the USA.<sup>30</sup> Beside less extensive environmental regulations, gas prices are also expected to be significantly lower in the USA than in Europe. Furthermore, the general investment environment seems to be more favourable in the USA, particularly after the Inflation Reduction Act.

### Examples for substitution of natural gas

BASF stated in its annual report that high natural gas prices were addressed by two measures. First, some gas-related processes (such as ammonia production) were stopped in Europe and relocated to BASF facilities elsewhere (mainly North America), supplemented by purchases from other companies. The company also reduced gas consumption by switching to alternative fuels.<sup>31</sup> Surveys carried out in 2022 indicate that more than two-thirds of short-term substitution in the German industrial sector relates to light fuel oil.<sup>32</sup> Many companies announced substitution plans, mainly referring to renewable electricity or green hydrogen, but in most cases detailed information on the timetable, volumes to be substituted or precise processes is missing.

The following examples from official publications and interviews give some anecdotal details on gas replacement strategies.

Evonik:<sup>33</sup>

- Gas replaced where possible, in the short term mainly with more coal and oil, in the medium term by electricity from North Sea offshore wind (2026).
- Extension of a coal-fired powerplant previously planned for closure in 2022.
- Increased share of LPG in gas-fired plants.

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<sup>26</sup> Wintershall Dea (2023). No timetable or detailed sales plans are mentioned there, only the intention to leave Russia in a "controlled way".

<sup>27</sup> BASF (2023a), p. 92f.

<sup>28</sup> BASF (2023a), pp. 151ff.

<sup>29</sup> BASF (2023b).

<sup>30</sup> Chemie Technik (2023).

<sup>31</sup> BASF (2023a), p. 23.

<sup>32</sup> BDI (2022). Key findings of this and other sources are summarized in Seeliger (2022), p. 6ff.

<sup>33</sup> Evonik (2023), pp. 9, 34, 68, 88.

- Increased use of waste gas from manufacturing processes (this measure was presumably independent from gas crises as this topic is located in the emissions section of the report).

Bayer:<sup>34</sup>

- Reduction of own electricity production with natural gas with substitution by external electricity purchases from German wind farms.
- Optimization, evaluation of possible alternative energy sources, and energy-saving programmes.

ThyssenKrupp:<sup>35</sup>

- Hydrogen direct reduction unit for steel production ordered in 2022, presumably ready in 2026.
- No further switch to oil or coal possible, as well as nearly no gas saving potential due to ongoing optimization processes.
- Alternative gas procurement methods (structured purchases at hubs) to curtail price increases.

Heidelberg Materials:<sup>36</sup>

- Increasing input of biomass (already has a higher share than natural gas) and other alternative fuels from 12 per cent now to 45 per cent in 2030.

Wacker:<sup>37</sup>

- No options in the very short term, but new heat pump with green electricity contract planned.

Food industry:

- A representative from the branches association reported that some investments in heating oil infrastructure have been made, but actually not fully used in 2022 (e.g., due to oil and gas contract price developments).

Plastic materials:

- A representative said that some companies had plans to switch to heating oil, but those measures were not realized in 2022. The main issue was the unresolved question of whether regional environmental regulations would allow such a switch.

## Conclusion and outlook

The following conclusions can be drawn.

- Significant reduction in gas demand and alternative sources of supply meant that the curtailment and suspension of Russian gas deliveries did not create any physical supply interruption.
- Most companies (mainly SMEs and/or non-energy-intensive industries) were not heavily affected by wholesale price increases. This is due to either long-term supply contracts with fixed prices for several years or, even if prices were raised by the end of the year, the negligible share of energy costs in total production costs.
- In contrast, some companies were hit heavily by energy price increases. This accounts mainly for large-scale and energy-intensive industries, as those mainly perform their gas procurement directly on the wholesale markets, or at least have supply contracts with some price indexation

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<sup>34</sup> Bayer (2023), pp. 75, 165.

<sup>35</sup> ThyssenKrupp (2023), pp. 28, 137, 143.

<sup>36</sup> Heidelberg Materials (2023), p. 149.

<sup>37</sup> Wacker (2023), p. 36.

to wholesale prices. The price effects are even more important in industries where gas is used not only as an energy source, but also as a feedstock.

- However, even within this group of companies, some differences become observable. Whereas some were able to pass the energy price increases through to customers (and in some cases, the price increase for final products was even higher than the energy cost increase), other were not.
- Finally, resilience to price increases was not uniform within German industry, nor was it sector-specific. Even within gas-intensive sectors such as the chemical sector, differences in the impact on companies could be observed. Differentiating factors include companies' specific product portfolio, energy procurement strategies, or relationship to the Russian gas players.

In principle, Germany is not a very favourable location for energy-intensive industries. Comparably high wages, taxes and social security duties, extensive environmental standards, time-consuming permitting processes for investments, a complex bureaucracy system, strict data protection rules, an increasing skilled labour shortage, and an ailing infrastructure are only some of the critical factors usually highlighted. Whereas electricity prices were also among the highest in the world, gas prices had been comparably moderate for years.<sup>38</sup> The price increases since 2022 are maybe not the biggest game changer that will displace German industry abroad—but clearly are another step in that direction.<sup>39</sup> Given this, some discussions around further state subsidies are ongoing. However, the current focus of political debate is on electricity prices for industry, whereas at present no further steps in addition to the already implemented gas price cap have been made public.<sup>40</sup>

When looking forward to this winter, most market participants see still price risks in the gas market, but no-one expects supply interruptions.<sup>41</sup> This view is also shared, more or less, by the regulator.<sup>42</sup> Furthermore, recently published studies about the gas supply situation during winter 2023/24 also back this optimistic position (but also include warnings about risks of a very long and very cold winter).<sup>43</sup>

When looking at the fundamentals, this position seems to be quite realistic. A number of factors are way more positive than last year.

- Storage is nearly full.
- There is no uncertainty in the market about Russian supply, which allows (or forces) all market participants to adapt their strategies early.

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<sup>38</sup> German day-ahead prices fluctuated between 26 and 44 €/MWh in August 2023 after reaching a top level of more than 300 €/MWh in August 2022. As a comparison, prices had never been above 10 €/MWh throughout the whole summer 2020. Source: Data from EEX for THE respectively NCG market area (<https://www.eex.com/de/marktdaten/erdgas/spot>).

See also OIES Quarterly Gas Review for additional information on the evolution of European gas prices (OIES, (n.d.)).

<sup>39</sup> A statement of Matthias Zachert, CEO of Lanxess, could be used as a testimonial for this thesis: "The demand recovery we originally expected in the second half is not yet visible—neither in China nor in other meaningful end markets. This impacts us especially in Germany: Here we are massively impacted by the disadvantageous conditions such as the high energy prices and massive bureaucracy. In times of weak demand Germany as an industrial location is just not competitive" (Lanxess, 2023b).

<sup>40</sup> Starting January 2023, a gas price cap of 7 ct/kWh was implemented for companies with more than 1.5 GWh yearly gas consumption. This cap only is valid for a gas volume up to 70 per cent of gas consumption in 2021. See BMWK (2023a) for details.

<sup>41</sup> Only a few companies directly address potential supply interruptions in their forecasts, and those who do so explicitly state that they are not expecting any physical interruptions. See e.g. BASF (2023a), p. 151; ThyssenKrupp (2023), p. 118.

<sup>42</sup> In addition to currently stable gas supplies and more than legally required storage levels, Bundesnetzagentur sees some issues for the winter to come. President Müller highlighted in a TV interview that maybe a combination of a very cold winter and a supply crisis in south-eastern Europe might bear some risks for German gas supply (Bundesnetzagentur, 2023b, p.1); see NTV (2023) for a summary of the interview.

<sup>43</sup> See VBW (2023); INES (2023).

- In contrast to last year, three LNG terminals are in operation, helping to replace missing imports from Russia.<sup>44</sup>
- In general, fewer imports are needed as further demand reductions, in addition to the already realized 13 per cent from last year, will come into force this year. As mentioned above, some investments have been initiated in 2022, of which some could be already be constructed in the course of 2023. An extraordinarily cold winter could derail some of these demand reduction potentials. But even in such a weather situation, markets and policy appear to be way better prepared, which should avoid “chaotic situations like in the last year with completely astronomic and irrational prices”.<sup>45</sup>

Last but not least, the regulatory framework is clearer than last year. In addition to the improved legal framework for LNG terminals, the role of Bundesnetzagentur as central coordinator and the rules for supply constraints in the case of emergency have become more transparent, which once again allows players to be better prepared.<sup>46</sup>

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<sup>44</sup> Import capacities of the three terminals in operation amounts to 13.5 Bcm as of summer 2023. Terminal expansions and another greenfield project will rise this capacity to around 30 Bcm in winter 2024/25. Further projects currently under discussion could boost the total LNG import capacity to 54 Bcm, but some of these projects are rather speculative. BMWK (2023b) summarizes the strategic view of the German Government on the LNG development plans. To put this in context, imports from Russia reached more than 50 Bcm in 2021.

<sup>45</sup> This was stated by Klaus Müller, president of the Bundesnetzagentur, in an interview in September 2023 (RND, 2023).

<sup>46</sup> These rules are not simple and easy to understand. Bundesnetzagenur published some guidelines to increase transparency and provide examples, but presumably not all market participants will have full understanding of these documents—at least not without support from legal or economic advisers.

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