



Federal Ministry
for Economic Affairs
and Climate Action

Industrial policy in changed times

*Safeguarding our industrial base, renewing our
prosperity, boosting our economic security*

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A. Foreword



It is obvious to everyone that German industry is facing major challenges. Russia's war of aggression against Ukraine marks a watershed, what the Federal Chancellor memorably called a "Zeitenwende", changed times, at the outset of the war. The persistently increased level of energy prices is a very tangible manifestation of these changed times. And this is just the latest expression of a deep-rooted change in the international geopolitical and geoeconomic realities, which are also resulting in great changes for German industry, e.g. in terms of secure access to raw materials. At the same time, we have to consider the following: the transition to climate neutrality and the related renewal of our prosperity offer medium- and long-term opportunities, but entail great efforts and costs for our industrial sector and its employees during the transformation process. Finally, the domestic business environment has deteriorated over a long period not least because necessary reforms and investments failed to take place; there was a failure to expand the use of renewable energy and to renew our infrastructure, dangerous dependencies were cemented in or even newly created, bureaucracy spread rampantly, and there was a lack of determination to tackle the skills shortage.

Germany has a long tradition as a strong industrialised country. I want that to continue. So we now need to use our industrial strength as a force

of renewal for future value creation and employment. I am fully confident that we can and will strengthen our industrial base once again, and will thus renew our prosperity. I base my confidence, first and foremost, on our industry – and on its first-class products, which are in strong demand around the world. And our industry is highly diverse, covering a spectrum from global corporations to the hundreds of "hidden champions" in the German Mittelstand and the thousands of small firms located all across the country. Also, our industry is highly innovative, and it partners with Germany's outstanding research community. And it has millions of highly qualified employees, and a culture of trusting cooperation between works councils and management.

But the challenges facing our industry demand a response from government. Ever since it took up office, this Federal Government has placed industry at the heart of its policies: We have taken off the brakes hindering the expansion of renewable energy. Together with our companies and consumers, we have averted an impending gas shortage, and have built up LNG infrastructure in record time. We have launched a comprehensive package to decarbonise German industry. We have made it much easier for qualified professionals to come and work in Germany. Investments in infrastructure like railways and roads are increasing.

The blockage impeding the CETA trade agreement has been removed. And we are deploying a unique funding package to strengthen Germany as Europe's leading manufacturing centre for semi-conductors.

And more is in the pipeline: Our tax rules, particularly for investments in climate action and innovation, are being substantially improved by the Growth Opportunities Act. The core hydrogen network is about to get going.

But major homework still needs to be done: We still don't have the bridge for energy-intensive companies that will bring us safely across to the other shore, where competitive industrial electricity is produced from renewable energy. We need a regulatory framework for the capture, use and storage of CO₂. Much remains to be done in the pruning of superfluous bureaucracy and the acceleration of planning and approval procedures. Much remains to be done in response to the repercussions of the changed international situation.

At the same time, there is a contentious debate in society about what role the state should play in support of industry. Many measures, such as the policy for attracting the settlement of semiconductor factories, or the bridging electricity price, are controversial. Some claim it would be better to

let market forces play unchecked and to allow the forces of creative destruction to unleash their full effects. They say that, given the massive change in the overall situation, it would even make sense to relocate basic materials industries abroad. Others conjure up a stark difference between large companies and SMEs, and use it to argue against support for those parts of industry facing particular pressures, because such interventions place them at a disadvantage. Finally, there are people who question the right of industry to exist given its (still large) impacts on the climate and the environment.

In view of this debate in society, industrial policy also means heightening awareness of the significance of industrial strength for economic prosperity, decent work, social participation and societal cohesion, and to keep presenting clear and comprehensible arguments for the measures we take.

For me, it is clear that our prosperity and social participation in that prosperity are tightly enmeshed with our industrial output. The significance of industry therefore extends far beyond economic aspects. It makes a crucial contribution to the cohesion of our society and its democratic stability. Industry is part of our country's social and cultural identity; it is deeply engraved in the ways we work and live our lives. This is not just about its inventions, its products and its brands.

Our entire system of the social market economy is highly interwoven with our industry. The growth in career prospects and material participation, the trade union movement, social partnership, co-determination in our companies – all of this originated in the industrial sector, and it still characterises the sector and our country today.

Our industry enables prosperity to become participation in prosperity. It offers decent jobs and incomes for broad strata of our society – from the skilled worker to the IT developer. In many cases, companies and the employment they generate provide a foundation for entire families and regions. This means that, today, in a time of uncertainty and worry, industry is still a cornerstone of social and societal stability in our country. It is also crucial for our security and strategic sovereignty in a riskier world, a world in which we need to have the necessary skills and key enabling technologies here in Europe.

We are not only holding these debates here in Germany – we are also holding them with our partners in the European Union, because industrial policy has to be thought through at a European level in a continent whose policy-making and economy is so deeply integrated. And because our industrial policy in Germany radiates out to the rest of the EU, both in economic and in security policy terms. As the largest Member State, we bear a special responsibility to justify our policies and to anchor them in the European strategy.

This industrial strategy serves all of this. It contextualises and justifies key decisions by the Federal Government, and it shows how these decisions should be continued and developed.

The strategy is rooted in a clear vision: Germany is to remain a strong industrial base, with its basic materials industry, in a time of upheaval, and is also to become an important base for the industries of tomorrow – from semiconductors to transformational technologies. This serves two aims: the renewal of prosperity and participation in prosperity, and the strengthening of German and European economic security in the face of the changed times and the climate crisis.

Strengthening our industrial future means that we need to respond to the changed and still-changing conditions. This is being done first and foremost by the wide range of stakeholders in our industrial community, by their efforts, and by their capacity to innovate. But government is also confronting this task. Here, both spheres – business and politics – know that, whilst they have to wrestle over the details, ultimately they need to pull in the same direction.



Dr. Robert Habeck
Federal Minister for Economic Affairs and
Climate Action

B. Industry's strength for Germany

1. Structural characteristics of German industry

Germany is a strong industrialised country, located in the heart of the EU, that can look back on a long success story. The strength of German industry lies, first and foremost, in the country's many innovative and productive companies, and in the outstanding performance of its workforce.

Also, the key characteristics of German industry include diversity. All too often, the German industrial sector is seen only in terms of a handful of large corporations. While Germany does have such corporations, of course, it also has a multitude of smaller companies – SMEs and family businesses – that are spread throughout the country. Fully 90 percent of all companies in Germany's manufacturing sector are SMEs with fewer than 250 employees. Because Germany's SME sector is both unassuming and highly successful, its SMEs are fondly referred to as "hidden champions."

Germany's industrial sector is highly diversified, and it produces an enormous range of different products. In the public eye, German industry is led by automotive, chemical, pharmaceutical and machine-tools companies, four sectors that generate annual revenue of about 1.2 trillion euros and employ some 3 million people. But German industry includes many other types of businesses, with companies operating in the areas of paper, glass, electronics, optics, textiles, cement, construction, steelmaking, defence, recycling, wind energy, heat pumps, aircraft, bicycles, and IT components and software, to name just a few in no particular order. Germany also has an important, and growing, industry-related-services sector. Boosted by servitisation, a trend in which product-only providers harness ongoing digitalisation to become providers of complete solutions, its importance is growing. In fact, more than 40 percent of all employees within

the manufacturing sector now work in services or services-related roles. In addition, services companies are playing an increasingly important role in ensuring that Germany's industry as a whole remains strong and innovative – for example, by providing data, digital applications or state-of-the-art communications technologies.

Germany's industrial companies are spread throughout the entire country, including all of its different regions. Virtually all parts of the country have SMEs that help shape the cities and regions in which they are located. Industrial clusters with focuses in the areas of automaking, machine tools, aircraft, chemical products, electrical equipment and optics are found in the north, south, east and west of the country. Recently, a diverse group of high-technology companies have established new locations in eastern Germany. They include Europe's largest semiconductor manufacturing site, and additional locations for cutting-edge semiconductor manufacturing are planned. In addition, a new centre for electromobility research and production is also being established in eastern Germany.

German industry's dense network of interconnections with the European single market is of key importance. About one seventh of every euro earned by German industrial companies is tied to intermediate products made elsewhere in the EU. At the same time, the EU is the most important destination for German exports; over half of the country's exports remain within the EU. German industry's success is intimately linked to the country's economic and political integration within the EU.

The manufacturing sector's key pillars include energy-intensive industry. In addition to being important in terms of their production volumes, energy-intensive companies are usually found at the beginning of complex value chains, and

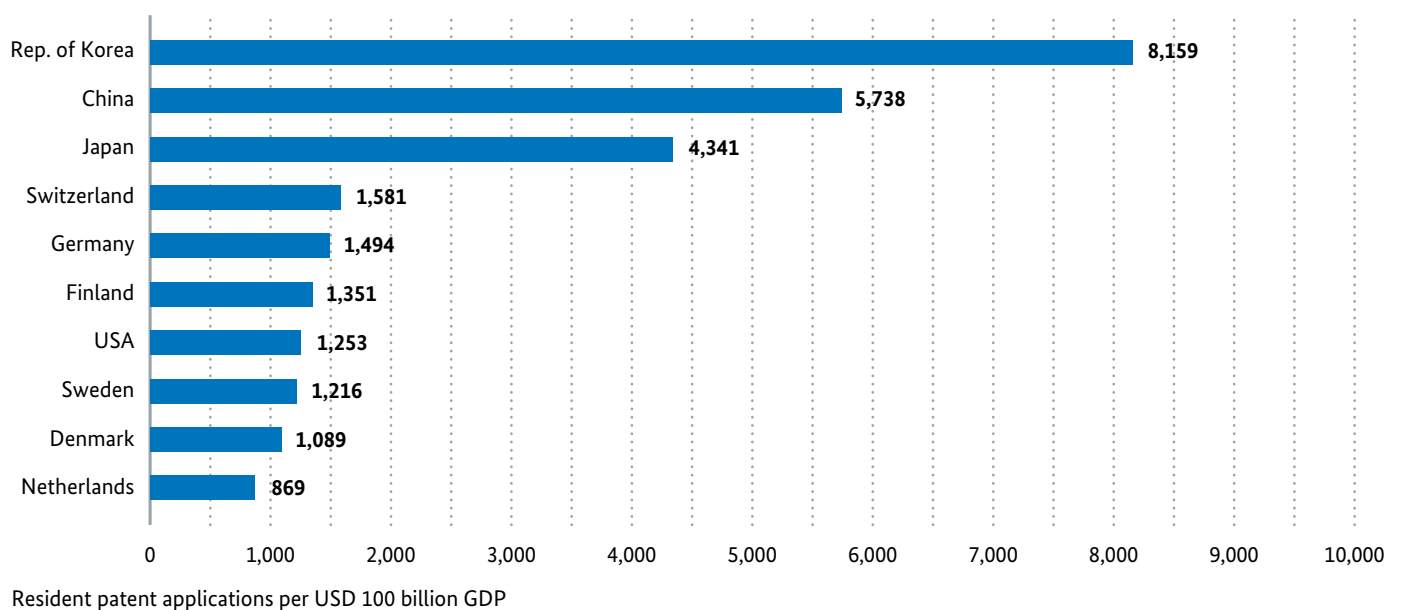
they provide intermediate goods for other key industries in Germany and throughout Europe. Energy-intensive companies are currently facing two major challenges: Germany's high energy costs (high when compared internationally) and the need to achieve climate neutrality. In energy-intensive sectors, energy costs account for a disproportionately high share of production value. In 2021, energy-intensive industry sectors accounted for about 77 percent of German industry's total energy consumption.

German industry has two additional structural characteristics of central importance. Firstly, it has long, integrated value chains: Germany does not only produce end products; it also produces components and feedstocks. And these different types of production are often in close proximity with each other, which is conducive to close cooperation throughout entire value chains. Such cooperation enables plastics and metals producers

to change their products' properties with optimal efficiency with respect to end products – for example, by using additives and alloys to increase their strength, reduce their weight, or modify their look and feel. The ability to work closely with raw-material suppliers gives companies additional freedom in product design and development. German industry harnesses the power inherent in such concentrations of different types of production to produce a never-ending stream of innovations. Also, large corporations maintain close links with SMEs, via interconnections in value chains, and through widely distributed stages of production. In such cooperative relationships, large and small companies work together on the same end products, and all benefit.

Secondly, German industry is strong in innovation. Research and development (R&D) expenditures accounted for a 3.13% share of Germany's gross domestic product (GDP) in 2021. And companies

Fig. 1: Patent applications in relation to GDP; top 10



Data for the year 2021. GDP data in USD (purchasing power parities for 2017). Top 10 countries of origin among countries with GDPs greater than 25 billion USD and more than 100 patent applications submitted by residents.

Source: World Intellectual Property Organization

bore the lion's share – some two-thirds – of such expenditures. Industry's R&D footprint is particularly large, accounting for about 80% of the business sector's share of R&D expenditures. Other indicators for the R&D sector show that Germany and German industry are among the international leaders in R&D and, as a result, are well equipped for the challenges that lie ahead. Such international leadership is seen in the area of patent applications, for example (see Fig. 1).

German industry is also among the global leaders when it comes to digitalisation. In fact, one out of every two industrial companies (48 percent) views its own sector as being among the international leaders – or even as a trailblazer – in the area of digital innovations. Germany is a global leader in the area of industry 4.0, and projects such as Catena-X are setting global standards.

Another important aspect to consider in connection with German industry is its culture of workforce co-determination and of social partnership between employers' and employees' representatives. German industry's success is also tied to the ways in which practically oriented training and institutionalised co-determination reinforce each other. Germany's "dual system" of training and combined study programmes, and its higher-education study programmes with strong application-oriented focuses, train young people in keeping with the needs of Germany's companies, and in close cooperation with those companies. Institutionalised co-determination enables employees

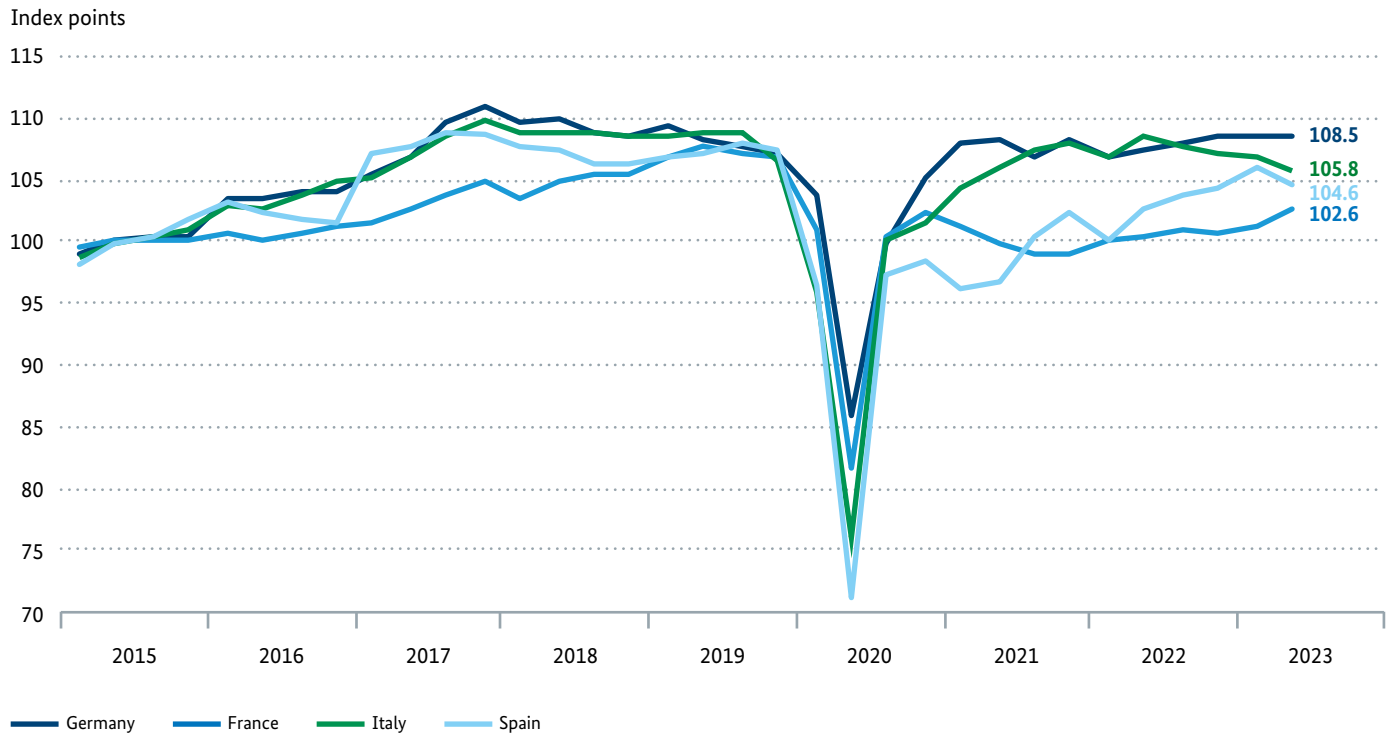
to participate actively in their companies' decision-making processes. It boosts employees' identification with their companies – and thereby enhances staff retention. As a result, it helps workforces build and deepen their knowledge and experience concerning company operations, including knowledge and experience that practically oriented training can pass on to the next generation.

2. Industry's importance for Germany

Thanks to its structural diversity, German industry has been able to weather crises and challenges again and again – and to be more robust than many observers would have expected. Manufacturing continues to account for about one-fifth of gross value added (2022: 20.4%). German industry's workers are especially productive, achieving 20% higher per-capita value creation than the overall average for the economy. The most-recent available figures show that energy-intensive industry generated about 140 billion euros of gross value added (with about 14 percent of all industry employees), while non-energy-intensive industry accounted for about 700 billion euros.

Figure 2 shows how industrial gross value added has developed since 2015. The shock caused by the coronavirus pandemic is clearly apparent. Since then, German industry has recovered quickly, in spite of supply bottlenecks, shortages of skilled workers and high energy prices – and has done so considerably more quickly, in fact, than the industries of other major European economies.

Fig. 2: Gross value added in the manufacturing sector



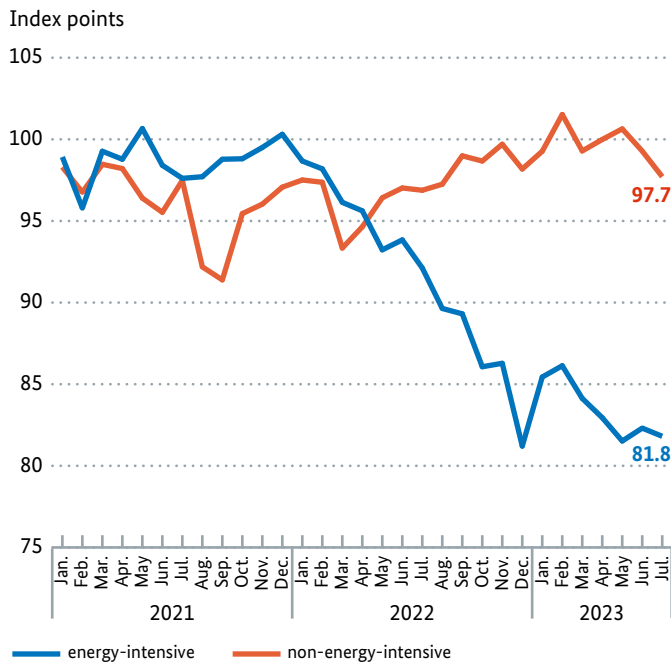
Index 2015=100; price-, season- and calendar-adjusted.

Source: Eurostat

Nonetheless, for certain sectors the current environment presents much greater challenges than the pre-pandemic environment did. While non-energy-intensive industries have proven to be remarkably resilient, production in energy-

intensive sectors has declined noticeably, without any subsequent recovery, as a result of energy-market disruptions tied to Russia's invasion of Ukraine (see Figs. 3 and 4).

Fig. 3: Industrial production

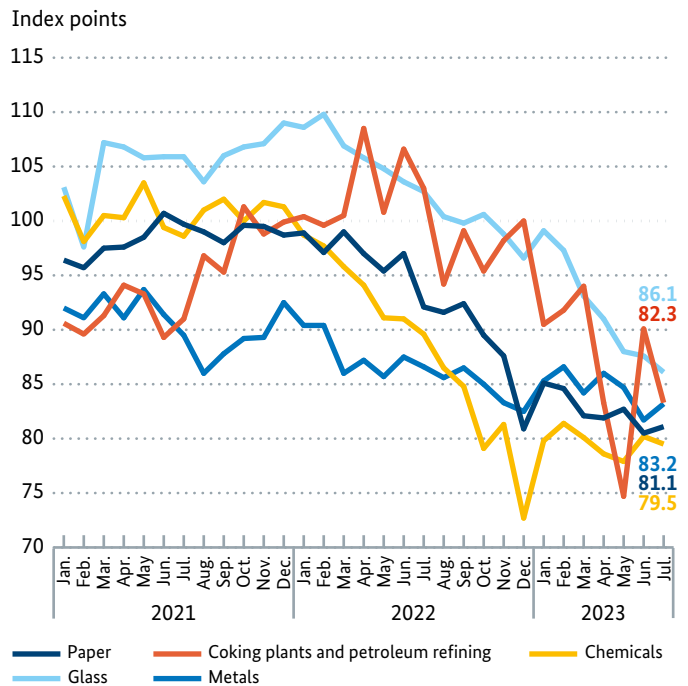


Index 2015=100; price-, season- and calendar-adjusted.

Source: Federal Statistical Office (Destatis)

Industry, with a total workforce of about 8 million, is an important employer in Germany. To that figure must be added millions of jobs at companies in upstream and downstream services sectors, companies that benefit from industry contracts and provide industry with key applications. Typically, industrial companies are attractive employers; they pay good salaries and offer attractive employment conditions. For employees of industrial companies, rates of atypical employment (part-time, marginal, fixed-term or temporary employment) are considerably lower than they are for the economy's total workforce (13 percent, as opposed to 21 percent for the economy as a whole). In addition, their pay levels exceed the averages for the economy as a whole: According to recent figures, the average gross monthly salary for workers in the electrical, metal and steel industries amounts to 4,300 euros, while the corresponding average for full-time workers overall (employees subject to social-in-

Fig. 4: Production index: Energy-intensive sectors



urance requirements) is about 3,600 euros. The good employment conditions found in industry are largely the result of the long-established social partnership prevailing between employers' associations and unions. Co-determination is considerably more widespread in industry than it is in the economy as a whole. For example, a total of 64% of employees at industrial plants with a least five employees work at plants with a works council, while the corresponding figure for the economy as a whole is only 38%. Employees benefit from co-determination. Studies have shown, for example, that strong co-determination structures can counter automation's potentially negative impacts on industry employment, and that companies with co-determination tend to invest more heavily in their own futures. Social partnership (partnership between employers' and employees' representatives) gives companies stability and planning certainty.

C. Challenges posed by our industrial base



Despite all its strengths, German industry is facing great challenges.

Challenge: changed geopolitical times

We are currently experiencing a fundamental change in the international economic order. The last few decades were dominated by market-driven but also rules-based globalisation. The idea was that goods and capital should move as freely as possible around the world. Barriers were vigorously dismantled, and strong institutions like the WTO were created in order to prevent the emergence of new barriers. Because of its social and ecological blind spots, this form of globalisation was rightly criticised; at the same time, it generated a lot of prosperity for the world and for Germany as an exporting nation.

However, recent years have seen the return of geopolitical and geoeconomic aspects, unleashing their full impact on economic policy. Three developments in particular can be traced:

- I. Efforts by countries to improve their own power position in the geoeconomic structure via a strategic technology and industrial policy. This applies especially to China. China pursues an industrial strategy which systematically aims to attain technological leadership and to force rivals out of the market. The “Made in China 2025” industrial strategy is a typical example of Chinese industrial policy. It identifies ten strategically relevant technology fields in the economy in which China aims to attain, by 2025, a leading international position of dominance on domestic and global markets and to dispose of a high degree of economic
- and technological autarchy. To this end, targets for the domestic market shares of Chinese companies are stipulated, and generous subsidies are provided that can and do severely distort competition. Ultimately, Made in China 2025 aims to replace foreign suppliers on the Chinese market. This is supplemented by China’s efforts to build its own global networks and dependencies (“one belt, one road”). These strategies are designed not just to be economic, but also to drive foreign policy and security interests.
- II. They are coinciding with a more expansionary orientation of autocratic regimes and, consequently, a heightening of the conflicts with the West. This reality broke over Germany as a watershed when Russia launched its war of aggression against Ukraine. We are also experiencing a weaponisation of trade as part of this new reality. Throughout the entire Cold War, the flow of gas to Europe was never interrupted, but that did happen last year. Comments by the Chinese leadership (e.g. President Xi to party institutions in 2020) also suggest that China is aiming to create economic and technological dependencies so that it can go on to exploit these in order to enforce its political goals and interests.
- III. We are experiencing – as a response both to this heightened geopolitical conflict situation and to divisions within its own society – a changed economic policy by our most important and closest ally, the United States. Firstly, the U.S. is conducting a targeted and rigorous policy of de-risking towards China. Secondly, the U.S. is very deliberately strengthening its own industry. The transatlantic relations con-

tinue to be dominated by shared fundamental values and partnership, as well as strong mutual integration which reaches beyond economic ties. The recently adopted U.S. Inflation Reduction Act (IRA) is on the one hand an important contribution by the U.S. towards mitigating climate change – a shared transatlantic goal. But at the same time, the IRA, in tandem with other policies like the CHIPS & Science Act and the Infrastructure Investment and Jobs Act, presents a genuine industrial policy challenge for Germany and the EU. It is true that subsidy programmes exist on both sides of the Atlantic. But the latest, massive boost from the U.S. administration threatens to distort the level playing field for key forward-looking technologies – to the detriment of Europe.

Germany – from policy-makers to business associations and many companies – refused for a long time to accept this changing reality, and failed to understand the risks deriving from it for us as an exporting nation. Instead, we kept imagining that economic interdependence is an adequate condition for the absence of geopolitical conflicts. This has proved to be a dangerous and expensive miscalculation.

In the light of the geopolitical realities, we in Germany and the EU therefore need to face up to critical dependencies in our supply chains. The German and European economies in general, as well as specific sectors of industry and individual companies, should not let themselves become overdependent on single sources of intermediate products or forward-looking technologies or on specific markets.

For example, more than 80% of the laptops and more than 90% of the photovoltaic systems sold in Germany originate from China. Such dependencies tend not to be seen as a problem whilst the supply chain works. But when it is disrupted, it is impossible to find alternative suppliers at short notice. This became clear for example when, during the pandemic, a long-lasting lockdown in the port city of Shanghai impacted industrial output in Germany because the upstream products were not arriving.

Whilst many mineral raw materials are sufficiently available in geological terms, this does not mean that corresponding raw materials will be available on time in the necessary quantities. The lengthy and costly processes involved in the exploration for, extraction of and processing of critical raw materials, which impede a swift expansion of supply, contribute to a high level of concentration on the raw materials market. In many cases, their extraction requires long run-up times and a high volume of capital. IEA analyses suggest that an average of 16 years pass between the exploration for and the first production of critical raw materials. So long time-frames are needed for the development and commissioning of raw materials projects.

Challenge: Neglect of key factors affecting the business environment

It is obvious that, despite ongoing strengths, key factors affecting the business environment have been deteriorating over a long time – not least due to failures to reform and strategic errors. Germany has afforded itself a long phase of self-satisfaction.

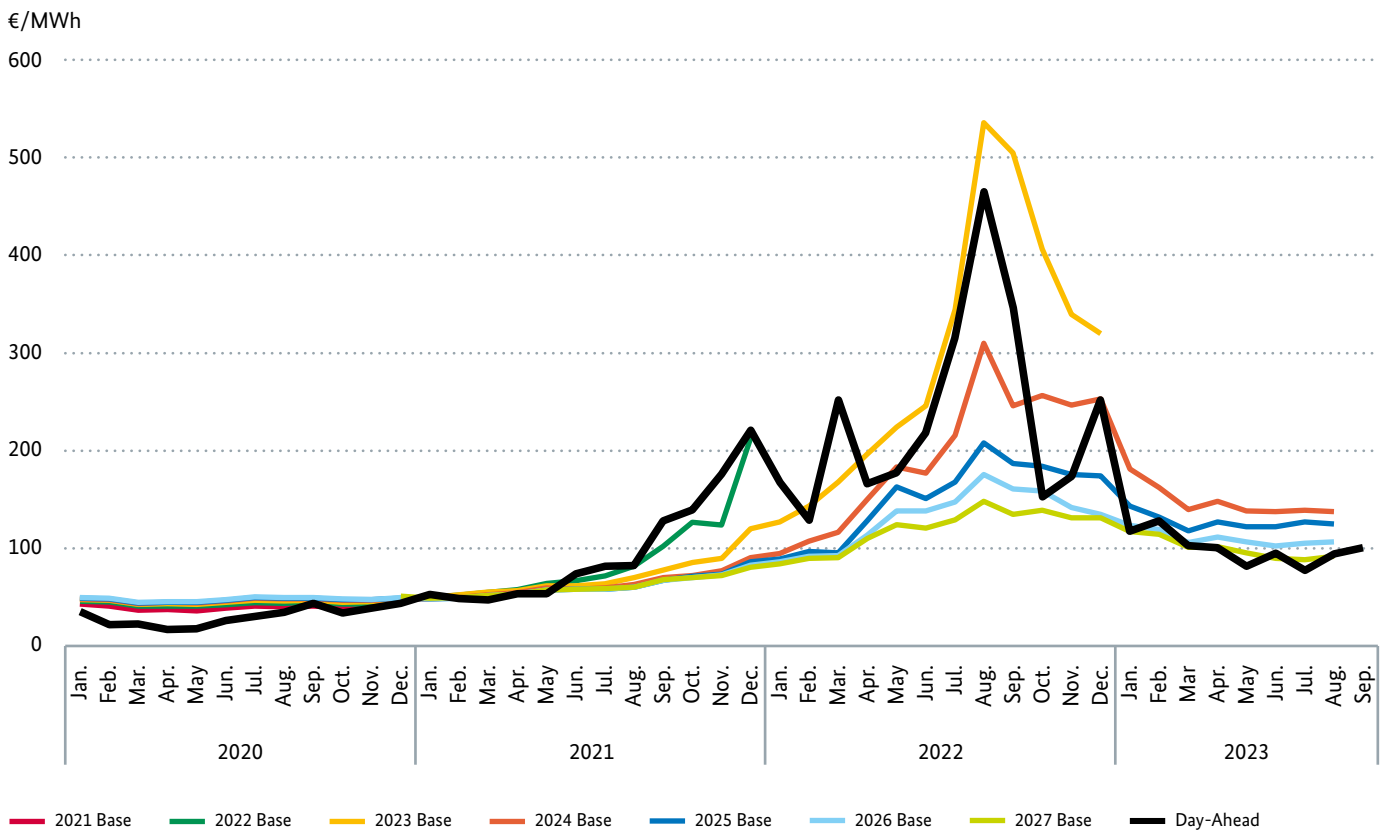
Energy prices

Energy is a central production factor – and its availability and price are correspondingly important. Industry consumed around 30% of total energy in Germany in 2021, and 43% of the country’s electricity. Energy-intensive companies facing international competition in particular are unable to pass on all the rises in energy prices to

their clients. There is a corresponding risk that they will respond by curtailing or relocating their investments or production.

After a lengthy phase of stability, the gas and electricity wholesale prices in particular rose sharply as a consequence of Russia’s war of aggression against Ukraine.

Fig. 5: Wholesale electricity prices by supply deadlines



Source: EEX, EPEX

The sharp rises in prices are the consequence of a two-fold error in the energy policies of the last ten years: An ever-greater dependence on Russian gas imports – despite numerous warnings – and a failure to push for a faster expansion of renewable energy.

As a result, prices have also risen steeply for industrial clients. Companies of differing sizes are

affected to differing degrees by this rise. In the case of smaller firms that obtain their electricity via energy suppliers, the price rises arrived after some delay and were cushioned to some extent by longer-term purchasing strategies. However, these purchasing strategies imply that the peak prices will also be felt over a longer period.

Fig. 6: Average gas price for non-residential customers, by volume of demand

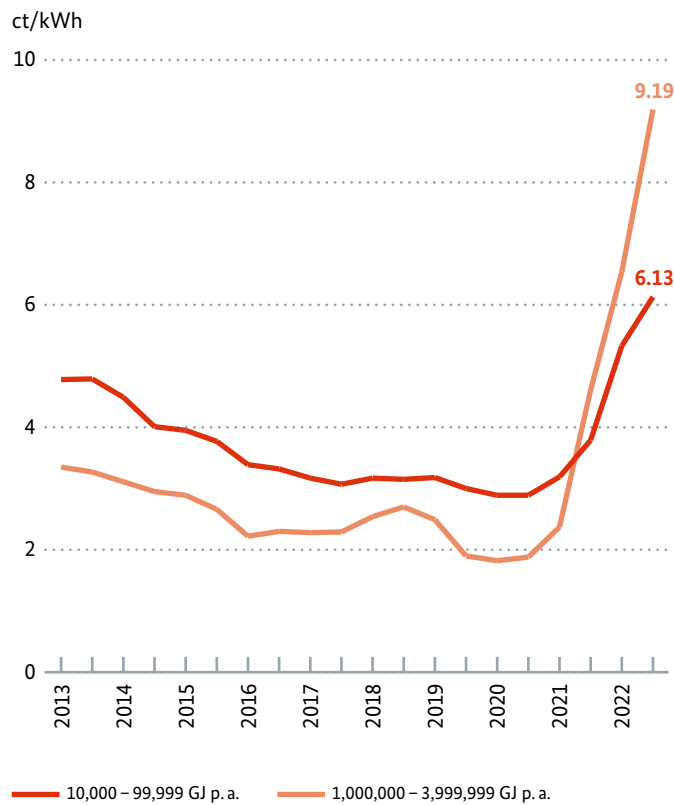
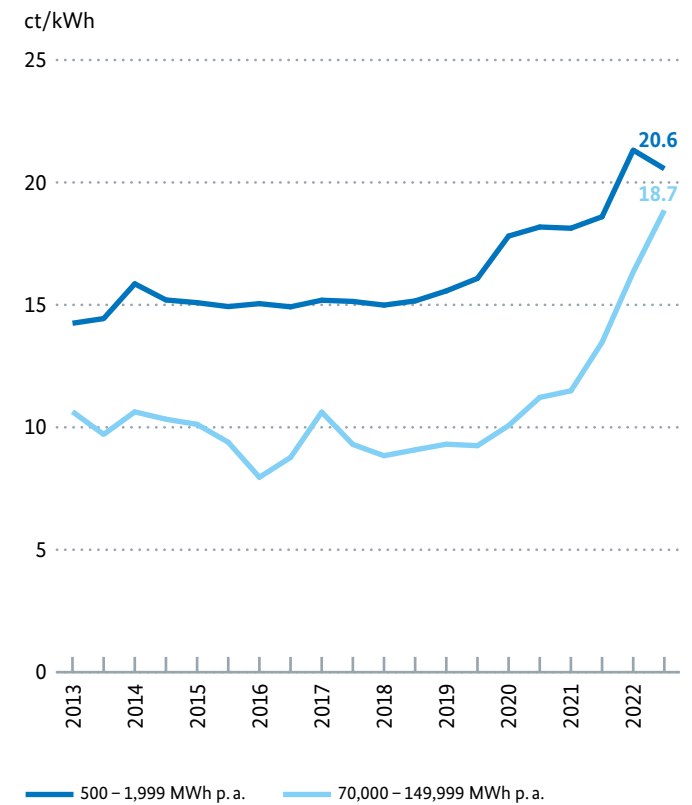


Fig. 7: Average electricity price for non-residential customers, by volume of demand

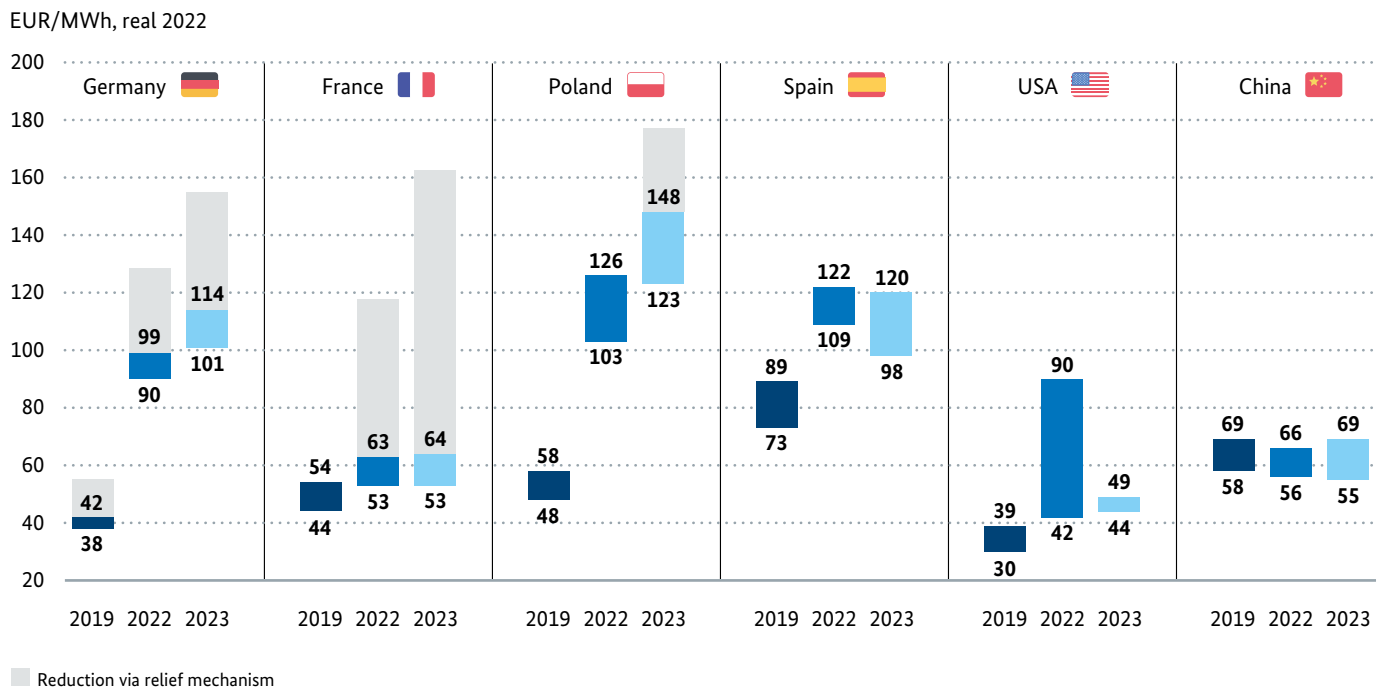


Total price, incl. taxes and charges, minus deductible taxes. Nominal figures. In some cases, lower electricity prices are possible for fully exempt large consumers.
Source: Eurostat

For some large-scale clients which purchase or generate their own electricity, the relative rise was dramatic. As a consequence, the competitive situation for many industrial companies, and especially for electricity-intensive companies, has deteriorated compared with the situation for firms

based elsewhere. Whilst the electricity prices for electricity-intensive companies in, for example, the chemical, steel and metal processing industry were competitive before the Ukraine war, many of these companies are now paying a much higher electricity price than rivals e.g. in France, the U.S. or China.

Fig. 8: Electricity purchase costs for industry; international comparison



The values shown are price ranges for the electricity prices actually paid, with all exemptions included, by large chemical, steel and metal-processing companies with constant load profiles. The price ranges include all the customary network charges, duties and taxes (with the exception of VAT) for the relevant markets. The calculations are based on the procurement strategies customarily applied in the markets of the relevant countries. For DEU, FRA and POL, the price ranges resulting from the applicable relief mechanisms are shown. The industry electricity prices for the U.S. are based on the procurement prices for Texas and Pennsylvania. The industry electricity prices for China are based on the procurement prices for the provinces Guangdong, Jiangsu and Shandong.

For the EU, the electricity procurement costs were calculated on the basis of an assumed procurement strategy applying a mix of spot-market prices (30 percent) and futures-market prices (70 percent). For the U.S. and China, the calculations were based on spot-market prices and regulated prices (with customary market discounts included), in order to take account of special regional circumstances. The following national relief mechanisms for industry were taken into account: DEU: Electricity price offset (Strompreiskompensation); FRA: Regulated Access to Incumbent Nuclear Electricity (ARENH) (90 percent); POL: Price brake.

Source: AFRY

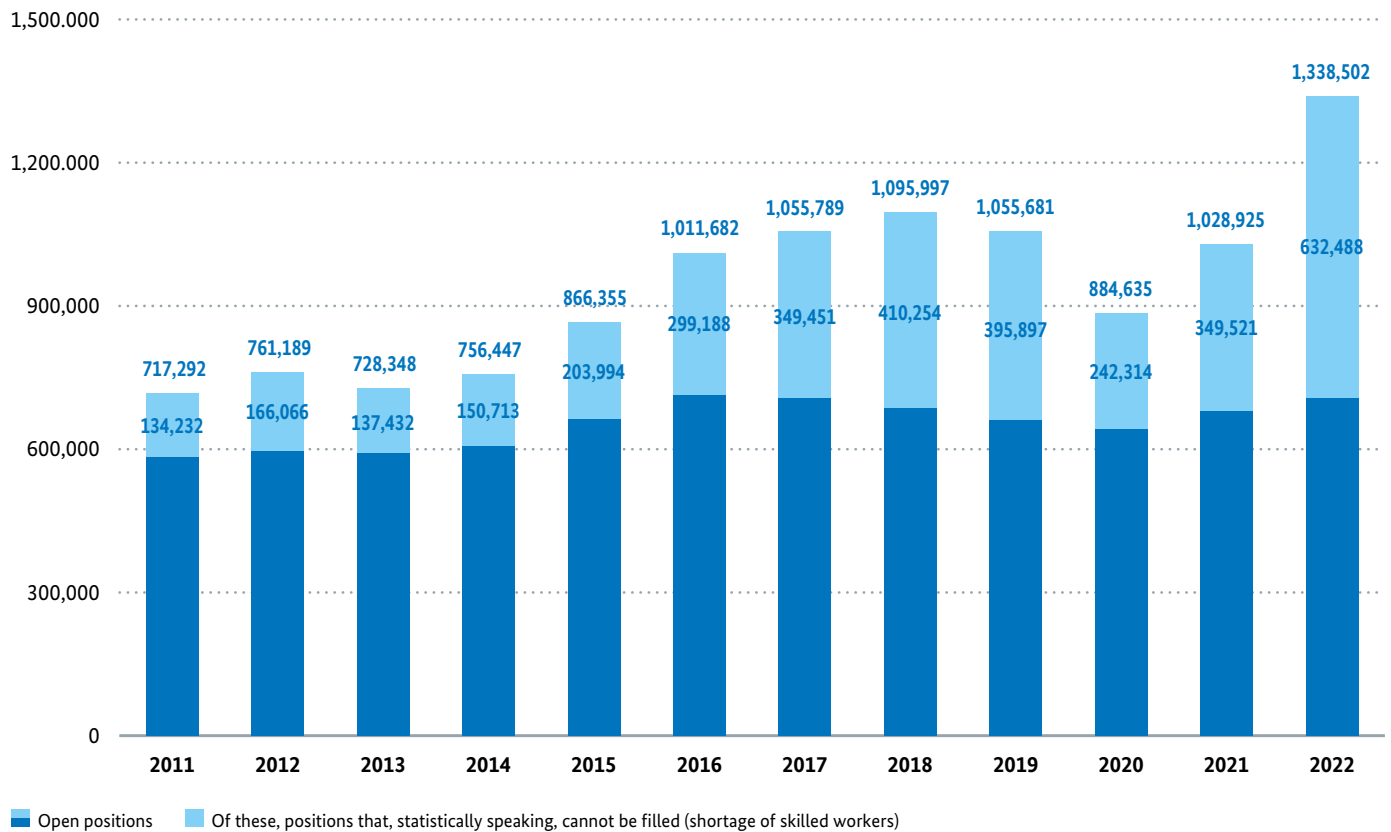
Whilst the futures market prices for the coming years suggest a slight fall in wholesale prices, they are not returning to the pre-crisis level. These prices threaten the survival of many companies in energy-intensive industry; there is a risk of the erosion of the German basic materials industry and thus of the disappearance of integrated value chains.

Skilled workers

The increasing shortage of labour and skilled workers is becoming more and more pressing; companies are finding it very difficult to fill vacancies, and are therefore clinging to their skilled workers.

For example, in 2022, it was arithmetically impossible to find suitable qualified unemployed people for an annualised figure of more than 630,000 vacancies (cf. Fig. 7). The availability of well-trained skilled workers is of central importance for our industry and has traditionally contributed to the innovative capabilities and competitiveness of German manufacturing. However, there is a risk that, unless far-reaching measures are taken, this competitive advantage will be lost. The economic survey by the Association of German Chambers of Commerce and Industry from early summer 2023 showed that 63% of the industrial companies surveyed already regarded this as a business risk for the next 12 months.

Fig. 9: Vacancies and the skills gap



Excl. ancillary activities; sliding annual averages. The skills gap describes the number of vacancies which mathematically cannot be filled by suitably qualified unemployed people.

Source: Kompetenzzentrum Fachkräftesicherung

The shortage of labour and skilled workers will worsen significantly due to two developments:

- I. Demographic change is resulting in a decline in the potential labour force. Over the coming years, the number of people who leave the labour force due to age will rise significantly. At the same time, the people born from 2005 on – now the cohorts with the lowest numbers of births – will soon reach adulthood. The corresponding gap is considerable: The cohort of those who are now aged 58-59 and who will turn 67 in 2031 (meaning they were born in the year with the most births), is – at its current level of 1.4 million people – almost twice the size of the upcoming generations of those aged under 18 today.
- II. Digitalisation and decarbonisation of the economy are resulting in massive shifts in the skills that are needed, so that even qualified workers will not necessarily have the right skill set for the new jobs.

Germany also still has deficiencies in key areas. The considerable deficiencies in the education system are resulting in too many people leaving school without a qualification or failing to obtain a vocational qualification. In 2021, around 47,600 young people (6.2% of the school-leavers) left school without at least having obtained a basic qualification. On top of these, there are around 2.65 million young people (17%) aged between 20 and 35 who have not completed a vocational training course. Furthermore, a disproportionately high number of women work part-time compared with other European countries. Mothers in particular would like to increase the hours they work. Studies show that around 25% of the surveyed mothers are not working, even though only 12% want this to be the case. 21% of mothers

work fewer than 20 hours a week, but only 12% of mothers want to work so few hours. Important domestic talents and potential are therefore not being used, and are missing from the pool of skilled workers. Also, the barriers to the immigration of skilled and other workers from abroad to the German labour market are still too high, especially for those from outside the EU.

Bureaucracy; planning and approval processes

The quality of the administration in Germany is basically high compared with other countries. The World Bank's World Governance Indicators, for example, award Germany top marks for the rule of law (e.g. property rights and the enforcement of contracts), effective regulatory action (e.g. the quality of public services and the public service, and the credibility of policy measures) and the quality of regulations (capability of the government to implement appropriate measures and regulations which permit and foster the development of the private sector).

Nevertheless, there are problems. Only 36% of business owners assess the public administration in Germany as being (very) efficient. Here, they are particularly dissatisfied with the flexibility and the speed of administrative processes (72% are barely, not or less satisfied). For example, in the field of approval procedures under immissions protection rules, around half of the affected companies report problems. In particular, they criticise the excessive effort and time involved in the procedures. A glance at the duration of approval procedures reveals a mixed picture. On the one hand, surveys by the Federation of German Industries say that immission approval procedures take an average of seven months following the confirmation that the application is

complete, i.e. no longer than is envisaged by law for regular procedures. On the other hand, this picture darkens when one considers the steps leading up to the issuing of the confirmation that the application is complete. For example, procedures last an average of eleven months from the submission of the documents until the issuing of the decision, and if one takes the beginning of the project as the reference point, they last as much as 18 months on average.

There is also a need to act in the field of digitalisation: It is true that the digital transition of Germany's administration has made progress since the introduction of the Online Access Act in 2017. But major challenges still exist. In its Digital Decade Country Report Germany 2023, the European Commission found that Germany is behind the EU average in terms of the availability of online public services for businesses in particular. There are still too few digital services available nationwide in order to relieve the burden on businesses.

Also, more and more red tape is stifling the economy and our industry. In general, the individual rules and regulations themselves are not viewed as a burden. The problem rather derives from the sheer quantity of them and, in particular, the complex interplay of the numerous statutory requirements. The reasons are to be found firstly in the large number of law-making levels, from the EU to the Federal Government and the Länder and municipalities. Secondly, laws are necessarily worded in abstract language. This creates discretionary scope in the enforcement of the legislation, which leads to a risk-adverse administration demanding more and more expert opinions. The upshot is what has become a thicket of bureaucratic rules and regulations that impede investments and growth. This is a burden in particular for small and medium-sized enter-

prises and the German Mittelstand – companies which cannot maintain their own department specifically to handle the bureaucracy. Despite numerous efforts, it has proved impossible so far to genuinely prune back this thicket: in the view of 65% of companies, compliance costs have risen appreciably since 2015 – despite the introduction of the “one in, one out” brake on bureaucracy and of a total of three Bureaucracy Reduction Acts.

Infrastructure

Furthermore, the competitiveness of German industry depends substantially on an efficient infrastructure – on intact roads, bridges and railways, fast internet and a reliable electricity supply, through to good educational institutions. In the international comparison, Germany's infrastructure may be relatively good, but it is not good enough for one of the world's richest economies. Comparisons of economies show that Germany has traditionally had good infrastructure, but that this advantage has tended to diminish in the recent past. For example, Germany ranked 14th of 64 countries in the World Competitiveness Ranking 2023 of the IMD, well down from the previous year's 9th place.

Gross fixed capital formation by the state, including for infrastructure, has indeed fallen since the early 1990s. Even if there has been a tangible uptick since roughly 2017, Germany's public investment currently stands at 2.6% of GDP (2022), well below the EU average (3.2%). In fact, Germany currently ranks third from last in this field in the EU comparison. Gross fixed capital formation by the Federation now stands – following a low point in the wake of the financial crisis (around 0.6% in 2014) – at a stable high level (2022: 0.8%).

The situation has been particularly problematic at municipal level since the beginning of the new millennium: in 2022, net investment in plant and equipment by the municipalities amounted to -€2.4 billion, i.e. the public capital stock declined, and with it the quality of the infrastructure needed for industrial success. According to a survey by KfW, the biggest investment shortfalls of the municipalities were in school facilities, followed by road and administrative office buildings.

Some work also still needs to be done at federal level. It is true that Germany has one of the best-developed transport networks in Europe. But substantial efforts will be needed to maintain and modernise the existing infrastructure, especially in the field of railway infrastructure, bridges and the tackling of congestion.

The digital sphere is also affected by deficiencies in infrastructure. Whilst more than 90% of all connections in Germany now have broadband access of at least 100 Mbit/s, only 19% of them are connected to the optical fibre network. In the field of mobile communications, Germany has 96% coverage by 4G networks, i.e. national coverage via basic mobile broadband connections. However, the current 5G standard, which is much more efficient and sustainable than 4G, is only offered by at least one mobile network operator across 89% of Germany's territory. Furthermore, it must be noted that the area-coverage figure does not indicate the actual quality and strength of the connections, which decline significantly on the edges of the area of network coverage.

Taxes and charges

Policy on taxes and charges has an important role both for corporate decisions on investment and for the international competitiveness of companies based in Germany. At the same time, tax revenues and charges play a crucial role in financing public infrastructure, the state social security network, and public services like child care.

The German tax system is complex and can pose a challenge to companies, not least due to the federal system. It takes resources and a lot of time to comply with the complex rules. There is still much potential to clear away red tape here, particularly through simplifications. At the same time, Germany's tax authorities are very well structured. Germany's tax system continues to deliver a high level of legal certainty and stability.

In terms of corporate taxation, Germany has the reputation of being a country with comparatively high taxes and charges. And it is indeed true that the average 30% level of nominal corporation and trade tax ranks Germany in one of the higher places in the OECD comparison. Germany also seems to have lost tax competitiveness in recent years in terms of the effective tax rates. This is partly due to a global trend to cut corporate taxes, e.g. in the U.S. and France. Sole traders and non-incorporated companies, in contrast, are generally subject to the progressive income tax. Furthermore, whilst the burden imposed on labour by taxes and welfare insurance contributions has trended downwards since 2000, it is still comparatively high.

Challenge: Climate-neutral modernisation

The third central challenge is the renewal of our prosperity in response to the limits set by the planet, and particularly to the climate crisis. Accounting for around one-fifth of Germany's greenhouse gas emissions, the industrial sector is a central field of action here.

The transition to climate neutrality is placing a number of wide-ranging demands on industry. Firstly, the manufacture of industrial products often tends to produce direct greenhouse gas emissions, which need to be reduced. Secondly, industry binds more than 10 million tonnes of fossil oil in chemical products like plastics each year, and following the end of their use these result in carbon emissions when they are incinerated as waste. And, thirdly, German industry makes a lot of products like internal combustion engines, which in turn generate their own emissions. The more the international community commits to climate action and lower-emission alternatives gain in significance, the faster the markets for such products will shrink.

Germany has set itself the goal of being climate-neutral by 2045, and the EU and more than 120 countries have set themselves a mid-century target for this. So we have just over 20 years until Germany needs to be greenhouse-gas-neutral. According to the Federal Climate Change Act, a reduction in emissions in the industrial sector by roughly one-third is necessary by 2030 (from 2022), or by -57% from 1990. If we are to reach this goal, the reduction rate has to be almost doubled compared with the long-term trend. So there is not much time for the transition to climate neutrality. This is particularly the case given the normal investment cycles and lifetimes of indus-

trial facilities. The energy transition will have to embrace many manufacturing processes in the next two decades. This means that facilities need to be rebuilt so that they can use climate-friendly energy sources like renewable electricity or hydrogen. There is a need for alternatives to the material use of fossil carbon in chemical products, e.g. an expansion of the recycling industry or the capture and use of CO₂. Finally, industry needs to develop new markets and replace products that have so far entailed the emission of greenhouse gases.

This transition brings great opportunities – for a renewal of our industrial base and its prosperity without destroying the climate and the environment, for new products and markets, for future-proof jobs. At the same time, it will involve substantial efforts and uncertainties – for the companies and for their employees. Some firms will shrink, new competitors will emerge, and well-tried processes and networks will need restructuring. Jobs will change, and some will disappear in certain sectors of industry.

The industrial sector has already made important headway towards the transition. Industrial emissions have declined by 41% since 1990. At the same time, gross value added by manufacturing firms has risen by around 80%. This shows that industry can grow in future as long as there is a sufficient fall in emissions intensity.

In the current projection report, the Federal Government is expecting industry to fail to hit its 2030 target. These estimates are subject to high levels of uncertainty and do not fully reflect the current cyclical situation and in particular the large falls in output in the energy-intensive sectors. But there is no doubt that the continued

rigorous implementation of climate action is urgently needed. The energy-intensive industries (e.g. steel, cement and chemicals) are particularly in the focus of the transition, as their emission intensities are comparatively high.

International competition also represents a substantial challenge to the transition of industry to climate neutrality. Around the world, many countries are taking a less ambitious approach

to climate action than Germany and the EU. As a consequence, our companies are competing on the world markets with rivals that have no or very low carbon avoidance costs. The higher the trade intensity in a sector, the greater the risk that production will relocate out of the EU to countries with less stringent climate regulations. Such carbon leakage would damage both our economy and the climate.

D. The power of renewal – industrial policy in changed times



1. Strategy for industrial policy in changed times

We need a strategic response to the major challenges facing our social market economy and our industrialised country not only from the companies, but also from government. Since it took up office, the Federal Government has taken key industrial policy decisions to safeguard our industrial base in line with the aims of a renewal of our prosperity and a strengthening of our economic security. This represents the laying of a foundation stone, not more, and not less.

In the two remaining years of the legislative term, it is now a question of continuing along the path we have set out on. At the same time, it is clear that just as the challenges have built up during more than a decade, the response to them will not be possible within one legislative term.

In the view of the Economic Affairs and Climate Action Ministry, therefore, industrial policy must be guided by the following strategic approaches:

- Industrial policy in changed times is necessarily always oriented to a European perspective.
- Industrial policy in changed times primarily means a strengthening of the business environment at home.
- Industrial policy in changed times also requires proactive funding policies in many instances.

A strong industry in a strong Europe

The framework for industrial policy-making in Germany is always provided in all areas by the European Union. The European Green Deal and the European industrial strategy form the strategic superstructure. Without many of the European

instruments like the EU Chips Act, the measures taken by the Federal Government would not be possible. In the other direction, we find that the maintenance of Germany's industrial base makes a major contribution towards safeguarding the industrial base across Europe as a whole. German industry delivers intermediate products and components for industrial firms from Finland to Portugal. And Europe's strategic sovereignty largely depends on our efforts in Germany to ensure that we have European manufacturing capacities for semiconductors and to bring our financial weight to bear for this. Our funding programmes are intended to strengthen sustainably high-grade value creation in Europe.

At the same time, our concept of economic security is European. If there are already sufficient manufacturing capacities for a critical product in Spain, Slovenia or Estonia, we don't need to provide state support in Germany to duplicate this. And if, for example, German and French companies jointly build a battery factory in northern France, this is not merely an expression of the close friendship between our two countries, but also a massive contribution to Europe's overall economic security. Economic security means that we, as the EU, do not render ourselves vulnerable and open to blackmail – not that every Member State needs to be able to make everything itself. That would de facto represent an abandonment of the single market, and would be a fatal error for German industry in particular.

It would be sensible to adopt a more European mindset in industrial policy, not least in order to strengthen the integrity of the single market. However, we currently lack both the financial envelope and the decision-making structures and capacities to take strategic funding decisions on a relevant scale. We should work on these preconditions. But until they are in place, strong national industrial

policies – anchored in the European industrial strategy and in line with European rules – remain indispensable for Europe’s prosperity and economic security.

Strengthening the business environment

Companies can only be successful here and survive in the face of international competition if they encounter an environment in which they can do profitable business in the long term and on which they can rely. We will only win the race for the future with offensive strengths and our own competitiveness.

We are therefore improving business conditions in Germany via a resolute transformational supply-side policy. At a time of declining availability of fossil energy, a growing shortage of resources, and a lack of skilled workers, the state should deploy such a policy to counteract the current shortages or at least to ensure that they do not worsen. In the medium term, this can reduce the inflationary pressure, as state measures aim to expand supply (e.g. via investments) and not to boost consumption. Here, we have set the following priorities:

- Expansion of the availability of energy in the form of a substantially accelerated expansion of renewable energy and grids. Roll-out of a hydrogen infrastructure and industry. Ensuring that electricity prices are competitive.
- Investment campaign for public infrastructure
- Acceleration of planning and approval processes, digitisation of the public sector, removal of bureaucracy
- Targeted immigration of skilled workers via the Skilled Immigration Act and improvements in training services

- Targeted tax incentives for corporate investment

The Federal Government has already undertaken significant efforts in all of these fields. However, important steps still need to be taken – particularly in the energy transition, the ensuring of competitive electricity prices, further acceleration of planning and the removal of bureaucracy, and the specific implementation of the immigration of skilled workers. The improvements in the supply-side conditions must form the central plank of policy-making in the second half of the government’s legislative term.

Targeted support and funding in the bridge decade

One aspect of our industrial policy is targeted financial support for companies and sectors in specific, clearly defined cases, i.e. a proactive role for the state that extends beyond the setting of a policy environment. We are not the only ones doing this; from the U.S. to many of our European partners, states are deploying this type of industrial policy.

This type of industrial policy is politically and economically contentious – not only, but especially in Germany. There are good reasons why this is the case. Providing funding to industry inevitably implies a policy choice which at least partially intervenes in market mechanisms, is prone to lobbying, and lacks a guarantee of success. Also, it ties up resources which could be used elsewhere.

In general, a smart design of funding instruments can alleviate these objections, but it cannot entirely rebut them. There is therefore a need for a special justification of the sort of broad-based and large-scale funding that we are deploying as part of our industrial policy – especially in the context of this industrial strategy.

Firstly, economists describe a whole range of cases in which a proactive state funding policy is justified per se because of market failure. In such cases, it can make sense for example to use state funding to help innovations become accepted on the market, or to support the scaling up of production. For certain forward-looking technologies, it is good economic policy in the best sense of the concept for us to progress the innovation process here in Germany to market maturity, and then to aim offensively to assume the technological lead in a central field.

But beyond this general economic justification of a proactive funding policy, there are good reasons in the specific German context why targeted financial involvement of the state forms part of our industrial policy toolbox in these changed times:

- Germany and Europe must respond to the changed geopolitical situation, particularly following the Russian war of aggression against Ukraine and in the light of China's increasingly aggressive stance. Just continuing as normal would be dangerous for the security of Germany and Europe and for our prosperity. **Economic security is therefore a new priority of our industrial and economic policy.** Initially, this means diversifying our raw materials relations, supply chains and sales markets. Dangerous dependencies must be scaled back, and trade relations diversified in general and intensified with allies. This also means that we need to retain strategically important industries in Europe, recover those we have lost, and attract new key industries. Autarchy would be an entirely wrong goal and counterproductive, not least because it would substantially diminish the resilience of our economy against domestic shocks – but it is necessary for us to dispose of skills and manufacturing capacities that can be scaled up if needed, in a network with our closest allies and especially within the EU. To this end, we will include more easy-to-action resilience criteria in public tender procedures and ensure that public funding strengthens the European value chain. However, we will also have to provide for direct support towards the establishment of manufacturing capacities. This will inevitably cost money. Economic security has its price – just as traditional security policy has its price. But we need to pay this price in a solidarity-based effort, in line with capacities and possibilities, if we wish to respect our own security interests and those of our Alliance partners. In addition, failing to strengthen our economic security would cost us much more. It would make us more vulnerable, dependent and, in a crisis, would cost the economy a massive amount. We have felt this painfully due to the Russian war of aggression against Ukraine and its repercussions on energy supply and energy prices. The interruption of the supply chains during the pandemic and the ensuing enormous costs for the world economy are also an indication of this.
- In the field of climate policy, many people rightly say that the best – because it would be the most efficient – solution would be a global carbon price. Many arguments about the sense or nonsense of financial support to achieve climate targets derive from this first-best scenario. But a global carbon price is currently just as unrealistic as the founding of a large climate club with a uniform carbon price: a carbon price will not happen in the U.S. for the foreseeable future. Instead, they are using the IRA to provide massive subsidies and tax breaks as part of a strategic industrial policy. China, too, only has a very low carbon price, but also massive funding and subsidies for transformational technologies like electric cars, wind and solar. We need to respond in the European Union and in Germany

to this reality of second-best climate solutions and the resulting competitive environment. Quite simply, in such an environment, a purely market-driven approach via emissions trading systems results in severe competitive disadvantages. So we need to **protect our industry from unfair competition** and enable it to **shift to climate-friendly production technologies** – firstly via countervailing instruments like the carbon border adjustment mechanism (CBAM) and trade defence measures by the EU, and secondly by ourselves funding central technologies to mitigate climate change. We are therefore trying to act as far as possible in alignment with the market, by for example opting for an auction system in the case of carbon contracts for difference, and thus relying on competition between companies to deliver the most cost-efficient emissions avoidance.

- We in Germany are at last resolutely and proactively shaping the shift to climate neutrality and thus the move to renewable energy. In recent decades, we have relied on and benefited from electricity from largely depreciated fossil-fired power stations and the availability of cheap natural gas. At the same time, we have failed to make the necessary investments in the future. We are now investing in the thorough renewal of our energy system. This effort will pay off; the resulting energy supply will offer competitive prices, security of supply and climate neutrality. However, we in Germany are primarily going through a phase of harsh transition at present, because last year – on top of the failures to expand renewables – we lost the bridge of cheap Russian gas. This transition phase will last until the early 2030s and will entail high adaptation and investment costs and a high level of insecurity. **Smoothing this transition phase**, in order to retain companies which can produce competitively here on a long-term basis, is well

justified both economically and politically. Economically, because destroying value chains due to a temporary phenomenon and subsequently rebuilding them entails costs. Politically because concentrated losses of production and thus jobs in certain sectors and regions can become a danger to social cohesion. At the same time, it is clear that in the long term only those companies will have a chance of survival which will be able to work with the long-term costs of Germany's new energy system. Germany has never been a country with the lowest energy prices, and will not be so in the future either, simply due to its geographical location.

The provision of funding for industrial companies which have taken in high profits for decades is not an end in itself, but it must serve societal goals like the safeguarding of decent work and participation in prosperity, climate change mitigation or our country's economic security. For this reason, the funding must be tied to contributions towards these goals. We will therefore be looking for guarantees for the continued operation of facilities and will, where possible, make adherence to collective agreements a condition of our funding.

In the design of funding programmes, we follow a range of principles. First of all, loans, guarantees and repayable grants should be prioritised, wherever possible, over non-repayable subsidies. The funding system should be coherent and subject to scientific success monitoring. Every funding programme should have an exit strategy, to ensure that unintended permanent subsidies can be prevented. At the same time, we will also ensure that access to our funding programmes is made easier, and that applications and administration entail less bureaucracy. Finally, we want to keep developing our funding mechanisms in a smart way so that we make the best possible use of the budgetary scope available and that, where funding is successful, it

can be repaid. The carbon contracts for difference are an important step in this direction.

Also, we want to work towards closer coordination with our closest allies of the provision of financial support, and thus prevent expensive subsidies races as far as possible.

In the case of many large-scale funding programmes, the Federal Government has taken key decisions jointly. These now need to be continued and upheld – and this raises financing issues. The Climate and Transformation Fund (KTF) has become the central financing instrument for investments in the renewal of our industry. The extra loan-funded finance added at the end of 2021 provides a good basis for this. However, the present financing structure of the KTF – its revenues derive solely from the EU emissions trading system and from Germany’s Fuel Emission Allowance Trading Act – does not meet the needs of a medium – to long-term funding horizon and the volumes of many of the industrial policy projects we have now launched together.

This is all the more the case as a rising carbon price, particularly for buildings and transport, must lead us to focus more on funding social relief relating to climate action, thus reducing the volume available for industrial policy projects. For this reason, from the beginning of the next legislative term at the latest, there will have to be a fundamental decision on how to find a robust and sustainable financial basis for the necessary strategic industrial policy to safeguard the economic base, to renew our prosperity and to strengthen our economic security. Our constitutional rules governing public finances emerged in times which were driven by market-dominating globalisation and by considerably smaller geopolitical tensions. We need to engage as a nation in a debate on how these rules can be adapted to the new realities. The costs of

the necessary renewal of our prosperity and the strengthening of our economic security must be borne on a basis of solidarity – to relieve those who cannot bear them otherwise. It is in this reconciliation of effort and solidarity, of performance and recognition, that our country’s future strength lies.

2. Measures for industrial policy in changed times

Since taking office, the current Federal Government has taken decisive steps in its industry policy, in keeping with these strategic concepts. These efforts need to continue receiving priority over the next few years. Specifically, the efforts can be grouped into three key areas of action:

- **Strengthening our competitiveness:** We have enacted a range of horizontal measures aimed at safeguarding and strengthening our industrial competitiveness. Additional such measures will follow, in areas such as our energy system, digitalisation and immigration of skilled workers.
- **Safeguarding our economic security:** To reinforce our economic security, we are diversifying our trade relations; investing in new, domestic production capacities – in areas such as semi-conductors and transformation technologies; and, by diversifying and expanding our circular-economy structures, safeguarding our long-term access to vital raw materials. We are taking decisive measures to these ends.
- **Renewing our key strengths:** We need to make our economy climate-neutral. As part of this effort, we need to renew the industrial base that has made us strong. To this end, we – at both the national and European levels – have defined a clear regulatory and emissions-trading framework, and launched comprehensive funding programmes.

In the following section, we detail these three areas of activity.

2.1 Strengthening our competitiveness

Since taking office, the Federal Government has focussed on the issue of industrial competitiveness, and it has taken numerous measures aimed at improving conditions for competitiveness in Germany. The effects of many of these measures will continue to grow throughout the coming years. Nonetheless, key questions remain to be answered in important areas – especially the areas of energy prices and energy-system acceleration – and they need to be answered quickly.

a) Protecting our energy supply, and making our energy prices competitive

Our long-term industrial competitiveness depends on our having a reliable supply of energy at competitive prices. This is especially true for energy-intensive companies, which are the backbone of German industry and which produce precursors and intermediate products for production in many other sectors. It also applies throughout German industry as a whole, however, from the smallest businesses to SMEs to large corporations. Our industry can have a bright future only if we succeed in ensuring that we have a long-term supply of energy at competitive prices.

Germany's energy system transformation

The transformation of Germany's energy system plays a central role in assuring our long-term energy supply: In the future, German industry will operate on a basis of renewable energies, including renewables-based electricity, hydrogen and climate-neutral hydrocarbons. In addition to being the right answer to the climate crisis, renewable energy sources can offer industry a reliable, long-term supply of energy at stable prices.

Expansion of renewables-based electricity generation – especially wind and solar energy – is central to our energy system transformation. In the current legislative period, we have taken the brakes off growth of wind and solar energy, as it were, by amending the Renewable Energy Sources Act (EEG) and the Offshore Wind Energy Act, and by adopting an offshore wind energy strategy and a photovoltaic strategy. And these efforts are having a real impact: Expansion of renewable-energy generation is accelerating markedly, and installation of new photovoltaic capacity continues to boom. Installation of new wind energy capacity is also moving forward clearly, but the full extent of this upswing will take a few more years to materialize, due to the lengthier approval procedures that apply in this area. In addition, we are developing a new power-station strategy, with a view to supporting transformation of our power-station sector towards hydrogen-based generation. With this strategy, we are already quickly providing planning certainty for investments in new gas-fired and hydrogen-fired power stations that will soon support renewable electricity generation from wind and solar energy.

In addition, we need to expand our energy infrastructure. Energy-infrastructure expansion plays a key role in ensuring the ongoing availability of an adequate energy supply for private energy consumers and German industry. In light of this need, we are expanding our electricity grid. In the future, for example, power lines will be in place to transport wind-generated electricity from northern Germany, and from North Sea and Baltic Sea regions, to centres of industrial consumption. To this end, we have enacted numerous measures for accelerated expansion of our electricity grids. Also, the newest version of the electricity network development plan (Netzentwicklungsplan Strom) provides for the development of a climate-neutral grid by 2045. Furthermore, to enable infrastructure

planning to take account of interactions within the energy system – interactions which are increasingly cross-sectoral – we are preparing a system-development strategy that, inter alia, will assure coherence between the development plans for electricity, gas and hydrogen networks.

Hydrogen and hydrogen derivatives will be the second major pillar, alongside renewables-based electricity, of our future energy system. Updating of the country's National Hydrogen Strategy will provide a basis for ensuring that at least 10 GW of domestic electrolysis capacity are in place by 2030. Germany also needs to make provisions for large-scale imports of hydrogen and hydrogen derivatives. In the interest of ramping up hydrogen imports, the H2Global organisation is already marshalling investments for the rapid establishment of hydrogen-production facilities and relevant supply chains. Also, Germany's National Hydrogen Strategy is being complemented by an import strategy aimed at enabling early decisions on necessary investments in hydrogen production abroad and in the necessary pertinent supply chains. In preparation for such investments, we have already concluded a range of pertinent agreements with other countries.

In addition, we are currently preparing a concept for the establishment of a hydrogen infrastructure for transport of hydrogen from production and import sites to industrial consumers. Also, we plan to amend the Energy Industry Act (Energiewirtschaftsgesetz – EnWG) this year, to enable early implementation of a first core network for connection of central hydrogen sites. The Federal Government's relevant draft law was approved by the Federal Cabinet on 24 May 2023. At the same time, near-term plans call for creating a legal foundation, within the EnWG, for an integrated gas/hydrogen network development plan. This will enable connection, outside of the scope of the initial core

network, of additional hydrogen producers, consumers and storage facilities. We plan to enact a Hydrogen Acceleration Act (Wasserstoffbeschleunigungsgesetz) that will simplify the legal and regulatory framework for use of hydrogen.

Also, we are focussing centrally on improving energy efficiency and on enhancing flexibility in electricity use. These two efforts play a central role in improving the competitiveness of Germany's industrial sector – and doing so especially in connection with use renewable energy sources. Energy-efficiency improvements greatly facilitate the major task of transforming our energy system. And the Federal Government has provided a first-ever legal framework for such improvements: the Energy Efficiency Act (Energieeffizienzgesetz).

The need for flexibility arises in that the coming years will bring more and more hours in which electricity is available free of charge or even at negative prices. Better digitalisation of the electricity system, and marketing of flexibility capacities in connection with industrial processes and heat generation, can help compensate for fluctuations in the availability of ultra-low-cost wind-/solar-based electricity – and reduce electricity costs.

Competitive energy prices

As a result of Russia's war of aggression against Ukraine, the prices for virtually all energy sources have risen sharply. Rapid expansions of our renewables-based energy system, and of the infrastructure it requires, will play a central role in the future of our industrial sector, since they provide the basis for lasting reductions in electricity prices. As such expansions continue, prices can be expected to return to competitive levels. The BMWK has presented a concept for a long-term, transformation-related, electricity-price subsidy, the "transformation electricity price" (Transformations-

strompreis). In so doing, we have shown how we can rapidly mobilise growing shares of low-cost, renewables-based electricity to give electricity-intensive industry, which faces international competition, greater planning certainty with regard to electricity prices.

Realistically, we must expect the exchange prices for electricity to remain high throughout the current decade. Therefore, we need to act on this issue. Immediately following Russia's invasion of Ukraine, and the termination of gas deliveries from Russia, the Federal Government joined with industry to begin establishing a new import infrastructure for liquid petroleum gas, and to do so at an unprecedented rate of speed for Germany. By enacting "brakes" on gas and electricity prices, we have acted rapidly to protect energy consumers – and, thereby, German industry as well – against price spikes. In the process, we have reduced economic burdens for companies and provided added planning certainty for the business sector. Working in cooperation with companies, and with the country's consumers, the Federal Government brought the country successfully through the winter and prevented acute gas shortages.

In addition, by assuming the burden of financing for the Renewable Energy Sources Act (EEG), via the Climate and Transformation Fund (KTF), we will save all electricity consumers a total of about 50 billion euros over the next four years, according to current forecasts. Small and medium-sized enterprises (SMEs) will profit especially from these savings.

Also, the Federal Government has made it considerably easier for companies to generate their own low-cost power supplies. As of this year, green power that companies generate and use in their own production sites is exempt from all duties and taxes. For SMEs in particular, this can be a practica-

ble way of considerably offsetting their charges for electricity drawn from the grid.

This option is not available for energy-intensive industry facing international competition, however. It has to absorb considerably higher cost increases, and it hardly benefits at all from the elimination of the EEG levy. What's more, because of the intense competitive environments in which it operates, it is hardly in a position to pass on higher electricity costs to customers. For this reason, in the coming years energy-intensive industry will need additional support as it struggles to manage the impacts of the war in Ukraine. The bridging electricity price proposed by the BMWK is the key instrument needed to protect industrial competitiveness – and, in particular, to protect primary industries – throughout a transition period until expansion of renewables-based energy production brings prices down. Otherwise, we will risk falls in production or even the relocation of structurally competitive companies away from Germany, particularly in the basic materials sectors. This would destroy the starting points of value chains which stretch across the whole of Europe. Making sure this does not happen is not only in the German interest, but also in the economic and security interest of the whole of Europe. We want to supplement the bridging electricity price with a continuation of the special discount on electricity taxes.

b) Modernising infrastructures

The Federal Government has approved a range of concrete measures aimed at overcoming "inherited" gaps in investments in the area of infrastructure. To spur investments, the Federal Government has committed additional funding for relevant capital expenditures: The government draft budget for 2024 includes 54.2 billion euros for this purpose, whilst its financial planning for the period

2024 through 2027 includes pertinent additional funding of about 23.2 billion euros.

In the coalition resolution of 28 March 2023, it was agreed that up to 45 billion euros would be provided for the railway network in the years 2023–2027, and that this would be achieved in part via use of pro rata income from the CO₂ surcharge in the truck road toll (LKW-Maut). Also, an additional 12 billion euros are to be provided via the Climate and Transformation Fund (KTF), through 2027, for investments of Deutsche Bahn (German railways). This funding is to be provided over and above the some 11.5 billion euros allocated for this purpose in the government’s core budget. The purposes for which this railway funding is earmarked include upgrades and further expansions of the railway network.

In the past, infrastructure modernisation was hampered not only by a lack of adequate funding. It was also slowed by long planning and approval procedures. Now, the Transport Authorisation Procedures Acceleration Act (Gesetz zur Beschleunigung von Verfahren im Verkehrsbereich) is expected to shorten approval procedures for transport infrastructure projects and facilitate faster, more-efficient and better-targeted investments. As a result, thanks to changes such as new options for determination of a predominating public interest in connection with selected projects, and simplified regulations for species conservation, it will become possible to considerably speed up railway-network expansions. In addition, predominating-public-interest criteria will also apply to especially important road and highway upgrades – in particular, to upgrades aimed at eliminating bottlenecks. This is significant in that a well-functioning road network is a key location factor for German industry, especially for SMEs.

The Federal Government is also working to upgrade the country’s digital infrastructure, via measures such as future-proof expansions and transitions to the newest standards. Via our Gigabit Strategy, we plan to have 50% of all households and companies connected to the fibre-optic network by 2025 and to achieve a 100% connection rate by 2030. We plan to achieve these goals by, inter alia, digitalising and accelerating planning and approval procedures, using faster, new cable-laying techniques, and collaborating more closely with the Länder, with local authorities and with market participants. The Federal Government is also actively supporting expansions and upgrades of mobile networks, by funding expansion of 5G networks (for example, via the “5G-implementation funding” (“5G-Umsetzungsförderung”) funding measure). At the same time, via projects such as INTERSOUL and 6G-CampuSens, we are making preparations for adoption of the future 6G standard.

c) Renewing Germany’s structures, and accelerating approval procedures

Over a period of decades, bureaucracy in Germany has developed into a veritable, and often impenetrable, thicket. Red tape has become a real obstacle for investments, especially investments by SMEs. Ideally, Germany’s administrations should serve as partners for companies. In short, bureaucratic and administrative procedures need to be accelerated, and red tape needs to be reduced – both in Germany and throughout the entire EU.

The Federal Government has already enacted a number of measures aimed at accelerating procedures, especially in the area of infrastructure expansions and renewable energies. In the interest of our industrial future, approval processes for industry also need to be significantly accelerated. The amendment of the Federal Immission Control Act (BImSchG) that the Federal Government has

now adopted is designed to streamline a first group of procedures, via measures such as strengthening the role of the project manager; restricting options for extending time limits for approvals; and facilitating digital submission of applications.

By no means are these measures enough, however. To bring about the procedural acceleration needed for the transformation of our economy, all of the state's administrative levels have to get on board. To this end, the Federal Government, working under the direction of the Federal Chancellor, and in cooperation with the Länder, is preparing a "Germany Pact" (Deutschlandpakt) on additional measures for procedural acceleration. As part of this effort, we also plan to look at ways of increasing approval authorities' personnel and technical capacities at the federal, Länder and municipal levels.

To a considerable degree, the legal framework for planning and approval procedures is governed by European law. Therefore, we are also working in the framework of European legal instruments to bring about faster approval procedures. Under the EU's Net-Zero Industry Act (NZIA) and Critical Raw Materials Act (CRMA), specially structured impetus has to be provided for acceleration of progress in central transformation sectors. The Federal Government is working intensely to ensure that the procedural facilitations provided by the NZIA also extend to production conversions to climate-friendly processes.

In the area of bureaucracy reduction, the Federal Government has taken decisive legislative steps, and it is making use of a new method: "Practice Checks" ("Praxis-Checks"), a BMWK-developed method for identifying, via cooperation between legislators, enforcement authorities and companies, obstacles and potential solutions for specific types of cases and investment projects. Following

a Practice Check on "Construction and operation of PV systems," additional Practice Checks are now to be introduced – for areas such as approvals of onshore wind energy systems, sustainability reporting, and startups. Also, this year the Federal Government plans to present draft legislation for a new bureaucracy reduction act (Bürokratieentlastungsgesetz). All government departments are being required to contribute proposals for relevant reductions.

In order to set a good example in this area, the BMWK has initiated a comprehensive, systematic review of all information requirements falling within its competence, covering aspects such as currentness, possibilities for harmonisation, unnecessary written-form requirements and other approaches for relieving burdens on business.

Bureaucracy-related burdens deriving from EU provisions also need to be reviewed. For example, the BMWK has carried out a consultation regarding bureaucratic obstacles at the EU level, relative to ecological transformation, and forwarded the results to the European Commission. In addition, the Federal Government is seeking to launch a European bureaucracy-reduction initiative in cooperation with France. Furthermore, the Federal Government is working at the European level for the creation of a common European portal for secondment notices under employment law. Initially, the portal would be used for submission of secondment notices (as e-declarations). At a later time, applications for A1 certificates would be handled through it as well.

d) Promoting innovation and cutting-edge technology

Germany is strong in research and development (R&D) – and our excellent research capacities provide decisive advantages for our industry. Innovation is the key to the continuation of German

industry's success story, and it is the basis for our technological and digital sovereignty. Innovation in Germany is driven by a great diversity of companies, from small world-market leaders to large corporations, and by the integration of its companies within a broad-based, diverse research landscape. In addition to higher education institutions, Germany's research landscape includes non-university research institutions that cover a spectrum including both basic research (Max Planck Society, Leibniz Association) and applied research (Helmholtz Association of German Research Centers, Fraunhofer Gesellschaft).

German industry is constantly reinventing itself, and its innovations help shape international markets. That said, it must be remembered that innovation leadership is nothing to be taken for granted, and it is not something that companies can control and assure on their own. Innovation leadership that can enable German industry to flex its muscles depends on a framework of support, latitude and the right conditions. The need to decarbonise our industry, and the enormous state R&D investments being made by global competitors, are significantly increasing the existing, already powerful innovation pressures.

The Federal Government's technology and innovation policy needs to reflect the diversity of German industry, and to offer solutions for the needs of companies and industry-oriented research. In the process, we are relying on various instruments, ranging from innovation funding with no thematic or sectoral restrictions to targeted support for individual key technologies.

Innovation funding with no technology restrictions is being aimed especially at SMEs. The BMWK offers a wide range of funding programmes in this area, such as the Industrial Co-operative Research programme for SMEs (IGF) and the Central Inno-

vation Programme for SMEs (ZIM). Via the IGF, pre-competitive research projects are funded, with a view especially to giving SMEs access to practically oriented research. Using grants, the Central Innovation Programme for SMEs (ZIM) supports, with no thematic or sectoral restrictions, market-oriented R&D projects of SMEs and of research institutions cooperating with them (including higher education institutions). It also provides support for management of innovation networks. The aim of these programmes is to strengthen innovation at SMEs. By supporting start-ups, we are bringing additional energy to industrial innovation – and broadening the foundations for new industrial technology leaders. The Federal Government's start-up strategy comprises 130 measures for a strong start-up ecosystem in Germany. It is oriented to an ambitious schedule throughout the current legislative period. In particular, Germany's well-developed system of early-phase financing for start-ups is being expanded to include high-volume options in the area of growth financing. The modules of the "Future Fund" (Zukunftsfonds), with a total volume of 10 billion euros, and mobilisation effects amounting to 30 billion euros, when private-investor funding through 2023 is included, will contribute significantly to the development of new growth companies. Our strengthening of tax-based research funding is also aimed especially at SMEs.

And the Federal Government trying out new approaches. Disruptive innovations can change existing markets from the ground up or create completely new markets. The Federal Agency for Disruptive Innovation (SPRIND) facilitates the translation of highly innovative ideas – in business, science and research – into successful products, services and jobs, in Germany and Europe. Under legislation known as the "SPRIND Freedom Act," SPRIND is now finally receiving the instruments it needs to carry out its work. Real-world labo-

ratories serve as spaces for prompt, safe trials of new technologies and innovative solutions that have not yet been approved for general use. We plan to introduce a Real-world Laboratory Act that will provide new space and leeway for testing of innovations. Successful examples – including real-world-laboratory testing of autonomously piloted buses, ships and drones; telemedical applications; and sustainable new housing and living-space arrangements – have shown that real-world laboratories can help translate new technologies and solutions into applications safely, and do so more quickly than would be possible by other means. At the same time, they strengthen acceptance of innovations, and they facilitate determination of how innovations, following their testing phases, need to be legally regulated, to enable the public at large to profit from them.

Technical standards help innovations enter markets. German industry plays an important role in international bodies for standardisation. The ways in which the Federal Government supports standardisation processes include targeted support and, now, the newly established German Strategy Forum for Standardisation.

Germany and Europe need to continue working to gain, and maintain, technology leadership in key technologies. In such efforts, the Federal Government is working together with European partners and with industry and business. The Important Projects of Common European Interest (IPCEIs), which are carried out by European alliances, are especially important vehicles for setting common priorities, combining resources and supporting private investments. In IPCEIs, groups of Member States join together to support highly innovative projects that can have significant spillover effects in the single market. Germany is participating in IPCEIs in the areas of microelectronics, battery-cell production, cloud-computing infrastructure, and hydrogen.

The pharmaceutical industry is also a strong driver of innovation. This became especially clear during the coronavirus pandemic, when companies based in Germany played a major role in developing life-saving medications. Those efforts generated significant gains in added value in Germany. During the pandemic, various dependencies became apparent, and supply shortages occurred. We want to enhance the attractiveness of Germany's pharmaceutical sector. For this reason, the Federal Government is working to improve the framework conditions for the sector. We want our pharmaceutical industry to be strong, sustainable and internationally competitive. To this end, we plan to develop proposals for improvement of EU procurement laws governing critical medicinal products. With the help of a study of requirements in the area of venture-capital funding, we are reviewing the issue of whether, and how, existing and planned non-sectorally-restricted options for growth financing can also be improved for other areas, including medical and bio-economic areas.

Quantum technologies are another key pillar for technical advancements, especially in the areas of sensors, communications, cryptography, simulation of quantum-mechanical systems, and computer technology. We are providing institutional support for the German Aerospace Center's (DLR's) Quantum Computing Initiative, and thereby acting on a central pillar of the Federal Government's Action Plan for Quantum Technologies. The Initiative is designed to contribute directly to the establishment of an entrepreneurial ecosystem for quantum computing in Germany. With this action, the Federal Government is also moving to safeguard Germany's technological sovereignty over relevant developments – and to anchor relevant innovation drivers more strongly in Germany and Europe.

We are also supporting industry in numerous other initiatives in this area. For example, the Federal Government is working determinedly to build Germany's core competence in the area of robotics. Our aim is to relieve the burden on human workers and establish robotics as an attractive tool for realizing economic and ecological efficiency gains – also for SMEs. We are also continuing our commitment to space programmes, which often operate at the limits of what is technically feasible. Such operations promote innovation in a wide range of areas, such as microelectronics and materials science. Applications using space-based data and services on Earth also hold great potential for innovation. The Federal Government's new Space Strategy is providing the basis for innovative, sustainable space programmes.

Lightweight construction is another important field of innovation. By constantly developing new solutions for weight and material savings and for functional added value, lightweight construction is continuously producing innovations that contribute significantly to the transformation of industry. The implementation of the lightweight construction strategy adopted by the Federal Cabinet this year is expected to make a decisive contribution to reducing greenhouse gas emissions and decoupling economic growth from the consumption of primary raw materials, as well as reducing dependencies on energy and raw-material imports. We are also strongly supporting the industrial bioeconomy, i.e. the use of bio-based instead of fossil-based products and processes. At the end of 2020, we launched an „Industrial Bioeconomy“ funding programme with the aims of scaling up bio-based products and processes that have been tested on a laboratory scale to an industrial scale and integrating new, scaled bio-based products and processes into regional industrial value creation networks.

Also, the „Development of Digital Technologies“ programme is promoting innovative research and development projects with lighthouse characteristics on a pre-competitive basis – including in the areas of artificial intelligence and quantum computing. With such efforts, we are seeking to strengthen Germany's status as a high-tech centre and to consolidate its digital sovereignty.

e) Moving the digital transformation forward

Germany continues to help set the pace for the digital transformation of industry towards a data-driven economy. The Industry 4.0 platform, which has been co-initiated by the Federal Government, and which brings together business, science, society and policy-makers, is providing impetus for digital solutions and the development of data-based ecosystems in industry.

The digitalisation of production processes, and digital cross-company and cross-sector networking, are decisive factors with regard to future competitiveness, as well as to the achievement of greater resilience and sustainability. In order to fully exploit the potential of the digital transformation, economic and industrial policy measures must take all facets of German industry into account. They thus must include targeted services, provided within a trustworthy framework and on the basis of a suitable infrastructure.

The BMWK-funded Catena-X project is a central lighthouse project for the creation of a data-based ecosystem in the automotive and automotive-supplier industry. This project is creating a global data space with an end-to-end data chain extending throughout the entire automotive value chain. The automotive industry's strong participation in this effort highlights the indispensable role that scalable digital ecosystems now play in companies' efforts to address a range of key issues.

The core project for the digital transformation of industry is Manufacturing-X, which builds on the experience of Catena-X and aims to comprehensively digitalise all industrial supply chains. The project seeks to cover the entire life cycles of products and production resources – from raw-material extraction to recycling. Also, digitalisation of SMEs is to be promoted through user-friendly participation opportunities and requirements-based application concepts. In this context, the Federal Government will provide a total of about 150 million euros for research and development through 2026, and further lighthouse projects are in the pipeline.

In addition to creating data spaces, the Federal Government is seeking to promote the comprehensive use of data. The data economy holds great potential for new business models in industry. Secure, high-performance and real-time cloud and edge technologies, as well as a high level of interoperability between providers and users, play essential roles in this context, with regard to efforts to reduce dependencies. To this end, we are working with eleven other EU Member States, in the framework of the IPCEI Next Generation Cloud Infrastructure and Services, to drive forward the development of an open cloud infrastructure based on European principles. In connection with the European Data Act, we have been working to strike a balance between incentives to promote data sharing and companies' interests in protecting their business secrets. The Data Act will lay the legal foundation for a modern data economy. We are also committed to the sharing of more and better data. The Federal Government's data strategy makes it clear that this is a task for society as a whole. Making data more readily available in Germany is also an important task of the Data Institute, which is currently being established. These activities are strengthening trust in the ways data is being handled, and they are supporting data sovereignty in Germany.

Data utilisation and evaluation also support the transformation of the industry towards climate neutrality. A digital product passport can contain data on the processed raw materials in the product, on how the product should be used and on how the product should be recycled/consumed. In administrative terms, digital product passports reduce the burden on industry by making it possible, for example, to provide declarations of conformity digitally and thus save paper at the same time. Fully digitalised production processes play an important role in efforts to strengthen the circular economy.

Also, AI solutions have great potential to be a key technology in this area, when they build on comprehensive data sources with both proprietary and third-party data. Data access/sovereignty is essential with regard to efforts to stay in touch with the state of the art in AI. In addition to yielding significant productivity gains, the increased use of AI can lead to completely new approaches and business models, such as the virtual creation and testing of chemicals or medicines without using any physical materials. We are committed to an innovation-friendly regulatory framework for AI in Europe, with a view to exploiting the potential of AI and to promoting investment in AI. With this approach, trustworthy AI can become a European trademark, set a good example internationally and provide competitive advantages for industry.

f) Stimulating and financing investments

In the coming years, investments will need to be significantly increased. For this reason, both tax relief and funding decisions must always focus, wherever possible, on bringing support and relief to bear on the specific areas in which investments can be stimulated. This orientation has guided the Federal Government's tax policy since the beginning of the current legislative period.

With a series of measures, we are providing targeted relief and tax breaks for SMEs in particular. These improvements are aimed especially at specifically incentivising and promoting companies' investment capacities and their transitions to more-climate-friendly and more-digital production processes, as there will be a massive need for private investment in this area in the coming years. In particular, the improvements include enhancements of depreciation opportunities and of options for offsetting tax losses; an expansion of the tax-based research allowance; and reductions of red tape in taxation, e.g. in the form of increases of various thresholds. SMEs in particular will be able to benefit in future from more-attractive tax relief on retained earnings, under income tax law. Another core element of the Growth Opportunities Act is the introduction of a tax-based investment premium. All companies that invest in the ecological transformation will be legally entitled to it.

In connection with the transfer of EEG financing to the Climate and Transformation Fund (KTF), the Federal Government plans to provide 50 billion euros of relief to the economy and industry over the next four years. SMEs will benefit disproportionately greatly from this relief.

The measures already presented by the Federal Government are responsibly strengthening Germany's tax structures and investment conditions. In addition, the implementation of the global minimum tax will curb harmful tax competition – and do so to the benefit of Germany's competitiveness and at the expense of known tax havens. German industry will also benefit from this.

However, ensuring that companies have full access to favourable financing for their private investments is just as important as providing tax incentives. To support SMEs in financing the transformation, the volume of low-interest financing in the

ERP loan programmes implemented by KfW has been increased. Access to financing has also been made easier by partially exempting house banks from liability. The range of financing on offer will also be improved through the expansion of existing and new loan and equity financing programs (e.g. Expansion of SME promotion via guarantee banks, and introduction of green ERP global loan leasing and of KfW syndicated loans for sustainable transformation). In addition, start-up financing and, in particular, growth financing, have been significantly strengthened – e.g. through the European Tech Champions Initiative for promotion of high-volume financing rounds, or the growth fund for institutional investors, which mobilizes private capital from institutional investors.

In the European context, we are also committed to completing the Capital Markets Union, in order to remove existing barriers to capital market transactions in the Union and to facilitate companies' access to financing via the capital market.

g) Ensuring that we have enough skilled workers

The central task in the coming years will no longer be to prevent the threat of mass unemployment, but to secure adequate numbers of skilled workers for companies. SMEs in particular, which often have to make do without large HR departments, are dependent on the state's providing support in securing skilled workers and creating the necessary framework conditions for personnel recruitment. The Federal Government has already done much in this regard. Its new skilled labour strategy, which forms the strategic framework for relevant efforts, contains measures that have already been implemented in downstream processes, or that are being implemented in such processes. The key areas of action in this connection include making better use of workers available within the domestic labour market, strengthening initial and further

training, and increasing immigration of suitably qualified persons.

The first area of action is to increase the workforce available within Germany.

In Germany, women have a part-time employment rate of around 45%, which is high by European standards. If more women are to become able to work longer hours, a number of obstacles will have to be eliminated. The availability of childcare – including at off-peak times – is a significant factor determining whether mothers, in particular, can extend their working hours. With the Good-Day-care Act (Kita-Qualitätsgesetz), the Federal Government has already taken steps to improve this situation in the current legislative period.

There is also significant potential to increase the amount of work carried out by older people. We should not deprive ourselves of the expertise, skills and experience of older people. Targeted incentives are therefore needed that can motivate older people to work longer on a voluntary basis. Despite considerable successes in increasing the labour-market participation of older people, early retirement pensions, for example, remain popular and work by older people is often limited to “mini-jobs.” Efforts to increase employment of older people must be oriented to voluntary participating and should be incentivised. The Federal Government has already taken an important step in this direction by abolishing the supplementary income limits for early old-age pensions as of January 1, 2023. However, the BMWK believes that further measures are needed that can make it easier and more financially attractive for older people to continue working by agreement with their employers. An important and obvious measure to promote employment among people who are already drawing retirement pensions would be to pay the employer’s contribution to statutory

unemployment and pension insurance directly to employees once they reach the standard retirement age, as is already done with employee contributions. Another option could be a tax exemption for employees subject to social security contributions above the statutory retirement age. In any case, the incentives should be designed in a way that overcomes the fixed thresholds that currently have the effect of limiting gainful employment by older people. As a further step, solutions should be sought together with the social partners for a flexibilisation of the fixed termination date in employment contracts when the statutory retirement age is reached.

Providing training for unskilled workers is another means of increasing the numbers of available skilled workers. In 2021, around 2.65 million young people between the ages of 20 and 35 did not have a vocational qualification. Potentially, these people could be integrated into the labour market, as skilled workers, through vocational training in Germany’s dual system. As it happens, Germany’s low youth unemployment rate, by comparison to the rest of Europe, can be attributed to the success of the country’s dual vocational training system. The Federal Government is working closely with stakeholders in the Alliance for Initial and Further Training to get more people into dual training. It is also important to attract more young people into training in the transformation occupations – and in many other fields of activity as well. This is why, in its „Made for something big“ (“Gemacht für was Großes”) campaign to boost numbers of skilled workers, the BMWK is also specifically promoting training in climate-oriented professions.

Hiring of refugees can be increased through targeted labour market integration. The IAB (the Research Institute of the Federal Employment Agency) recently showed that 54% of refugees find employment within six years (with a significant

disparity to the detriment of women). In the short and medium term, successful integration of the more than 500,000 Ukrainians seeking protection will be of particular relevance. The keys to successful labour market integration of refugees include assisting them in rapidly learning German (first and foremost), speedily recognising their professional qualifications, and providing them with training and further education. Also, legal barriers to labour market integration need to be removed, in a targeted manner. The Federal Government has reached agreements on various measures to this end. Inter alia, the current prohibitions on working during the asylum procedure are to be relaxed in certain areas, the granting of work permits for tolerated persons is to become standard procedure, and options for “employment tolerance” („Beschäftigungsduldung“) will be extended. Under “employment tolerance,” employers can rest assured that they will not suddenly have to lose their well-integrated (refugee) employees. The agreed measures will enhance refugees’ possibilities of entering the labour market quickly and – most importantly – being able to stay in it.

The second important factor in combating the shortage of skilled workers, to help secure the future and success of German industry, is facilitating the immigration of workers, especially qualified skilled workers. For too long, it was assumed in Germany that the country could remain competitive even without significant immigration, although demographic trends and labour market data have been telling a different story for years. Since taking office, the Federal Government has initiated a comprehensive rethink and has placed central emphasis on ensuring that the German economy, and German industrial companies in particular, have sustainable and long-term access to skilled workers, including through immigration.

The central measure for this is the new skilled labour immigration law that was adopted in summer 2023. Comprising a law and an ordinance on the further development of skilled labour immigration, it simplifies and accelerates the immigration of skilled workers and other workers.

The provisions of the law and the ordinance will enter into force gradually, beginning as of November 18, 2023. The Federal Government has approved accompanying measures that will support the successful implementation of the provisions of the law and the ordinance. These include intensified advertising under the umbrella brand „Make it in Germany“ – the Federal Government’s portal for skilled workers from abroad; acceleration and simplification of visa and administrative procedures; and the lowering of obstacles to recognition of qualifications.

The third aspect has to do with qualification and further training, which play an essential role in **safeguarding jobs affected by structural change** and offering employees a future in transformation sectors. The challenge in this area is to **train and retrain employees** in line with the future needs of companies. This year, with the **Act to strengthen the promotion of initial and further training** (Gesetz zur Stärkung der Aus- und Weiterbildungsförderung), the Federal Government has enhanced the instruments available in the area of labour market policy, in order to address the needs of the rapidly changing workplace and to help prevent unemployment caused by structural change. Among its central instruments is the new **Skills Development Benefit**, which enters into force on 1 April 2024. For companies that would normally have to cut jobs as a result of structural change, it enables the companies to provide further training that can lastingly protect the jobs at risk.

h) Strengthening the EU single market

The EU single market is a key location factor for German industry: its value chains extend throughout Europe, and the EU is its most important export destination. The EU's profound economic and political integration has made it possible to create uniform standards, provide legal security and uphold a level of (internal) mutual market access that is globally unparalleled. The single market is a driver of good ideas and new industrial products. As an export nation that is especially strong in exporting industrial goods, Germany is especially dependent on the single market's proper functioning, with internal borders that remain permanently open, and on the continued progress and deepening of European integration.

To be strong, and to be able to develop green lead markets, and for the sake of its environmental sustainability and social balance, the single market needs uniform, well-enforced standards. Harmonised standards, if they are simple and consistent, help to reduce bureaucratic obstacles and make it easier for companies, especially SMEs, to operate across borders. In addition to supporting harmonisation in areas such as products and services, we support the creation of common single market regulations with a broad industrial policy approach (NZIA, CRMA).

Also, we support forward-looking competition law; such law is deeply in Germany's interest. Fair competitive conditions for companies throughout the EU are an essential prerequisite for success, especially for German companies with locations in many European partner countries. In addition, functioning competition is a key driver for innovation and start-ups. The following aspects are key for us in this regard:

Firstly, now, in these times of green and digital transformation, it is more important than ever to ensure that Member States can act quickly and that companies can plan with certainty. Excessively long processes, and a lack of planning certainty, amount to a real competitive disadvantage by comparison – for example – with the tax credits provided for in the U.S.'s Inflation Reduction Act. The next EU Commission should make it its mission to speed up processes considerably.

Secondly, competition law must be geared towards the global competitive situation and the EU's actual scope for action. It is important that there be fair competition within the EU – but the price of establishing such fair competition cannot be allowed to be European companies' falling behind globally. We must therefore ensure that national industrial policies aimed at renewing our prosperity, or at safeguarding our economic security – also in the interests of Europe as a whole – do not fail due to laws on state aid.

2.2 Safeguarding our economic security

The Russian war of aggression against Ukraine, and its economic policy consequences, have shown us how industrial dependencies on autocracies, including both direct and indirect dependencies, can affect the resilience of our economies and our foreign-policy options. Direct dependencies occur via direct sourcing of raw materials and intermediate products; indirect dependencies occur via supply chains. In either case, aggressive actions by autocracies can cause severe disruptions.

In recent decades, the significance of such dependencies has too often been overlooked. All too often, the attendant security policy risks and economic costs have been often ignored. Since taking office,

the Federal Government has been gradually correcting such risky dependencies, via a holistic approach that balances the interests of German companies and their employees with the need to strengthen German and European economic security. Its actions to this end have included adopting a National Security Strategy and a China Strategy.

In terms of industrial policy, this new approach consists of three building blocks:

Firstly, the way to greater economic security is found not through more protectionism and isolationism, but through more **openness and diversification**. To this end, the Federal Government has injected new dynamism into the country's trade policy. We have moved forward on the Comprehensive Economic and Trade Agreement (CETA), and we have intensified negotiations for agreements with a range of countries around the world. At the same time, we are realigning our foreign trade policy instruments. We are more carefully scrutinising potential investors in the German market, and identifying risks of unwanted transfers of German technology.

Secondly, after analysing the relevant geopolitical and economic risks, we have concluded that Germany needs to have its **own production capacities** in certain areas. In these times of change, this naturally applies first and foremost to the defence industry: We in Europe must be able to meet significant shares of our military equipment requirements, and of the requirements of our closest allies, ourselves. To this end, we want to take steps towards enhanced cooperation in the security and defence sector, and towards further consolidation in the European defence industry. Such steps serve to strengthen Europe's strategic sovereignty.

At the same time, the need for our own production capacities also applies to semiconductors, which

are an indispensable basis for modern industrial production and for key technologies for the energy transition and the decarbonization of industry. There are good reasons to assume that Germany can be a leading location for such industries, in the long term: we can offer the right location conditions. That said, given the massive subsidies being provided in other parts of the world, we cannot expect companies to locate in Germany unless we provide large-scale state support. Significantly, such support can have enormous positive effects on our economic security in Europe. In this situation, the Federal Government has decided to promote the establishment of production capacities on a large scale – and it has already convinced a range of companies to locate in Germany. In this context, we are also focussing on reinforcing existing strengths – for example, in fields such as power semiconductors or microcontrollers. Such strengths support our foreign policy options and our sovereignty.

Thirdly, the coronavirus pandemic and the Russian war of aggression against Ukraine, and the resulting shortages and disruptions of raw materials and intermediate products, have revealed the risks of certain dependencies. Given that the transformation is expected to increase demand for mineral and metallic raw materials, such dependencies may well increase as well, unless we act to counter them. In keeping with this insight, we have updated and fleshed out key aspects of the Federal Government's raw materials strategy from 2020. The new orientation in our raw materials policy emphasises the following: firstly, expanding our circular economies (including recycling), and improving our resource efficiency; secondly, diversifying our raw-materials supply chains, by expanding our international raw-materials partnerships, and strengthening our domestic mining sector; and, thirdly, ensuring a fair and sustainable market framework by developing and applying effective

ESG standards, standards which will benefit us in the international competition for raw materials.

The Federal Government has launched numerous measures in these areas over the last 21 months:

a) Horizontal measures for strengthening our economic security

Our prosperity is largely based on Germany's success as an export country. Industrial goods made in Germany play an important role in this regard. Every year, Germany exports around 1.5 trillion euros worth of goods. The bases for this success include European integration, with the single market as its centrepiece, and Germany's good trade relations, within the framework of a functioning world trade system, with countries worldwide.

As an exporting country, Germany depends, economically, on having functioning, diversified trade and investment relationships. And in addition to being vitally important for Germany, such relationships contribute significantly to Europe's economic security, because they reduce dependencies on third countries. At the same time, companies have a considerable vested interest in reducing their dependencies on individual sales markets and supply sources, and in reducing dependencies within their value and supply chains. To reduce such dependencies, companies have to carry out ongoing risk analysis that also takes account of geoeconomic issues. As part of Germany's diversification strategy, we support such efforts through economic diplomacy and effective foreign trade promotion. For example, to support German companies in developing new procurement and sales markets, we offer investment guarantees, at particularly favourable conditions of coverage, for diversification activities.

In addition, after years of uncertainty, the Federal Government rediscovered its negotiating skills in trade policy. In our trade agenda, we have adopted new guidelines for fair trade policy on all sides, including a binding chapter on a level playing field for trade and sustainable development. This is one of the reasons why Germany was finally able to ratify the CETA agreement with Canada. We are resolutely pushing ahead with further agreements in Latin America and the Indo-Pacific in this spirit. In doing so, we are also focussing on respecting fundamental workers' rights and the Paris Agreement; we view both of these areas as key areas that trade agreements must take into account. On the basis of our trade agenda, we are creating a more-sustainable, fairer range of products and services, and opening up new markets for German and European industry. In addition, we are continuing to focus on free and fair global trade, which is a boon to German foreign trade. We need a level playing field worldwide, especially for German industry. In export financing, we have boosted the liquidity available to small and medium-sized enterprises, and especially for small-volume transactions, and we have introduced the "forfeiting guarantee" for Hermes export credit guarantees. The improved range of financing options now available is facilitating access to challenging markets, and promoting diversification of markets and supply relationships.

At the same time, we have responded to the changed geopolitical conditions by analysing the relevant risks and geoeconomic challenges for the national economy. We plan to use this effort as a basis for reviewing our range of instruments – and sharpening our instruments where necessary. We are doing this together with our partners in the EU and worldwide. The Economic Security Strategy of the European Commission and the High Representative of the Union for Foreign Affairs

and Security Policy of June 20, 2023 focusses on strengthening competitiveness and technological sovereignty; on improving protection against risks to economic security; and on strengthening cooperation with a wide range of partners and promoting trade agreements. In all of this, we are balancing the need to maintain a high degree of openness in trade and investment relations with the need to strengthen our resilience and to reduce economic risks. It is important to note that the measures we take will be proportionate.

As an industrial centre, Germany needs to have a smart location policy, especially for its key sectors and forward-looking industries. That said, in seeking to counter undue distortions of competition, we also rely on the consistent application of the EU's trade-policy protection instruments (anti-dumping and anti-subsidy instruments). In addition, the BMWK welcomes the draft EU regulation on protection against economic coercion by third countries, which the European Parliament approved by an overwhelming majority on October 3, 2023. It will protect Europe's sovereignty in cases in which third countries seek to use trade and investment as weapons for bringing about certain decisions („weaponisation of trade“).

Investment audits have become much more important in Germany and Europe in recent years. Germany plans to remain an open investment location in which foreign investment is very welcome. However, foreign investments must not be allowed to compromise our security. Consequently, the Federal Government is considering ways of enhancing investment-screening laws that would make it possible to meet the current challenges even more effectively. The focusses of these efforts include, inter alia, modernising the existing industry case groups for which reporting obligations and lower audit-entry thresholds apply, and improving identification of intellectual-property transfer with

regard to important technologies (e.g. via licensing agreements).

In addition, we will use the existing legal options to prevent sensitive technology outflows that can be misused for the proliferation of weapons of mass destruction, uncontrolled buildups of conventional weaponry, or internal repression and human rights violations. We are continuing to develop export controls in these regards. To this end, we plan to coordinate closely with our European and international partners. With regard to investments abroad, we want to work with our partners to prevent autocratic states from improving their military and intelligence capabilities with the help of our companies' capital, specific expertise, networks and knowledge. We are working with our European partners, in the framework of an expert group, to examine the extent to which additional measures might be needed to counter such risks in connection with foreign investments.

b) The microelectronics industry

Microelectronics is key to digitalisation and transformation processes, and it will be key to most industrial products of the future. Microelectronics components and semiconductor chips play a fundamental role in efforts to expand renewable energy sources; enhance efficiency in energy use; and develop electromobility, artificial intelligence, supercomputers and new telecommunications standards (5G/6G). And their importance is not limited to the realm of future and emerging technologies. Virtually all industries and sectors depend on microelectronics. Microelectronics is a driver of innovation, value creation and employment. It is therefore vitally important to have independent, secure access to trustworthy microelectronics.

The microelectronics industries of Germany and Europe are strong in the areas of power semicon-

ductors, sensors, microcontrollers, plant engineering, wafer production and software design and development. Europe's production capacities are currently unable to keep up with the demand for microelectronics components, however. As a result, companies in Germany and Europe have to rely extensively on imports. The majority of production and design capacities for microelectronics, throughout all structural sizes and chip types, are currently found in Asia and the U.S. In those areas, market players also have large shares of other important segments of relevant value chains, in areas such as development of supporting software, production of chemicals and back-end manufacturing (assembly, test, packaging). Because microelectronics value and supply chains tend to be globally integrated, they present risks of disruptions and dependencies, especially since global competition between chip-producing regions is increasingly taking place within geopolitical and security-policy contexts.

In the interest of their own technological sovereignty and competitiveness, therefore, Germany and Europe need to expand their own research, development and production capacities for semiconductor technologies and applications. In the process, they need to strengthen their existing competencies and close critical technological gaps. At the same time, they have to take account of current and future requirements in the industries that use the relevant products and systems. And this focus also has to include targeted efforts to train the next generation of skilled workers in the area of microelectronics. For this reason, we are providing extensive funding, and carrying out a range of measures, aimed at sparking private investment throughout the value chain, and at promoting the growth of secure, sustainable microelectronics sectors in Germany and Europe. The pertinent measures are oriented to the European Commission's aims of doubling Europe's share of

worldwide semiconductor-production capacities to a level of 20% by 2030, and of strengthening the EU's semiconductor ecosystem overall. European instruments such as Important Project of Common European Interest (IPCEI) projects and the European Chips Act are providing important investment incentives, and the necessary state-aid framework conditions, for the targeted funding that is needed.

With a view to strengthening innovation and transfer of innovations into industrial production, and collaborating within the framework of a European alliance, we are using IPCEIs to support research and development of microelectronics to initial industrial applications. Via the first IPCEI on Microelectronics, a total of 18 German companies have been supported, with funding totalling up to a billion euros, in building state-of-the-art chip factories and developing high-performance, energy-efficient microelectronics components. Via a second, even more comprehensive, IPCEI on Microelectronics (IPCEI on Microelectronics and Communications Technologies), and in cooperation with 11 German Länder, we are supporting 31 German projects, with total funding of about 4 billion euros, in development of leading- and cutting-edge microelectronics products throughout a broad spectrum that includes such aspects as raw materials, wafers, production equipment, chip manufacturing and processing and applications. All in all, private investments totalling tens of billions of euros are being mobilised. In addition, several thousand highly skilled jobs in the semiconductor industry and upstream and downstream industries are being created.

That said, it must be remembered that the global competition is intense: Around the world, chip-producing regions are seeking to attract semiconductor manufacturers with the help of enormous funding programmes. For companies,

the construction and operation of state-of-the-art semiconductor fabrication plants entails major financial challenges. The relevant costs are often in the billions. With this in mind, we are getting involved in efforts to strengthen our supply of chips. Working on the basis of the European Chips Act, we are supporting the establishment and expansion of semiconductor production facilities in Germany. Such investments necessarily have the effect of bringing state-of-the-art technologies to Germany and Europe. Major investments in this area, such as those being made by Intel in Magdeburg, and by TSMC in Dresden, create crystallisation points for the development of ecosystems including upstream and downstream industries and suppliers.

c) Transformation technologies

If Germany is to reach its climate policy goals, it must expand its renewable energy sources on an unprecedented scale. To date, Germany is still highly dependent on various non-European countries when it comes to the systems and equipment needed for such expansion. For example, China is far and away the major producer of cells for solar modules, and it produces about 60% of the world's wind turbines. Crisis-related disruptions of supply chains, along with new geostrategic circumstances tied to Russia's war of aggression against Ukraine, are presenting considerable risks for the proper functioning of the relevant value chains.

We are addressing this situation in two ways. First, we are working intensely on diversifying our value chains. Second, we are focussing on establishing production sites for transformation technologies in Germany and the EU. This is urgently necessary, because it will enable us to ramp up production as necessary and to keep critically important know-how within Europe. For this reason, we are supporting the ramping-up of German and European

production of products and systems in the area of transformation technologies (photovoltaics, wind energy, batteries, network components, electrolyzers, large heat pumps, CCU/CCS). These efforts are in keeping with the aim of the Net-Zero Industry Act that has been proposed by the European Commission and that is expected to be adopted in the near future.

In 2022, with a view to establishing our own production capacities, we initiated a Stakeholder dialogue on industrial production capacities for Germany's energy system transformation (Stakeholderdialog zu industriellen Produktionskapazitäten für die Energiewende – StiPE). In December 2022, that process was then successfully completed, with the issuance of recommendations for action. A number of the recommendations for action are already being addressed via existing measures, and others are now coming into focus.

For example, to provide targeted incentives for the establishment and expansion of domestic production capacities, investments in lighthouse projects of the photovoltaic industry are to be supported. To this end, in summer 2023 we carried out an interest-determination procedure, and it revealed that industry is strongly interested and ready to contribute to efforts toward the above goals. The options for state funding in this area are defined by the EU's Temporary Crisis and Transition Framework (TCTF), which is also to be used to promote investments in other transformation industries. A federal funding programme announced on 15 August 2023, entitled "Resilience and Sustainability of the Ecosystem for Battery-cell Production" ("Resilienz und Nachhaltigkeit des Ökosystems der Batteriezellfertigung"), builds on this framework. It will fund strategic investments and major projects for strengthening the battery value chain, throughout the spectrum from raw materials to battery cells, and including related systems for reuse and recycling.

To be able to contribute effectively to Germany's energy-policy and technological sovereignty, investments in transformation technologies must have a long-term perspective and must be profitable. Fortunately, this is feasible, in light of the strengths of industry in Germany and Europe, such as innovative, highly efficient and environmentally friendly / climate-friendly production methods. In the interest of ramping up production, and of opening up a long-term market perspective, the criteria for public contract awards and tenders will not be limited to prices only. They will also include qualitative criteria such as CO₂ intensity and contributions to the resilience of applications.

Accelerating the expansion of renewable energy sources also entails carrying out major projects and making large investments. Use of hedging instruments is being discussed with a view to protecting projects, and the early phases of production. Such instruments would guard against the special risks that manufacturers face – for example, in connection with expansion of wind energy, production of network components and development of other key technologies. Currently, there is a need for new instruments in this area, as well as for adaptations of existing instruments (financing, guarantees). Therefore, taking account of EU regulations for state aid, we are reviewing the possibilities for temporarily expanding existing instruments such as the KfW's funding programmes.

d) Raw materials and circular economies

At the beginning of 2023, we updated and detailed the Federal Government's raw materials strategy. The central measures it provides for include strengthening circular economies and supporting companies in diversifying their raw-materials sourcing. In the process, obstacles and legal barriers hindering use of recycling-based raw materials are to be identified and eliminated, and pertinent

rules and standards are to be adapted accordingly. The strategy's key emphases include intensifying monitoring of the situation in raw-materials markets. In September 2023, the German Mineral Resources Agency (DERA) published a "Recycling atlas for metal production" ("Recyclingatlas für die Metallerzeugung"). The strategy's key emphases also include reinforcing the strategic orientation of international cooperation in the mineral resources sector, via establishment and expansion of international bilateral and regional partnerships, and support of concrete projects and initiatives of companies and scientific institutions. In the framework of the Critical Raw Material Act (CRMA), development of coherent Environment, Social, and Governance (ESG) standards for imports of raw materials and pertinent processed products is to be supported. Also, the CRMA framework calls for reinforcing raw materials production within the EU.

Our measures in this area also include the funding programme "Raw materials for transformation" ("Rohstoffe für die Transformation"), which will commence in 2024. This R&D programme is aimed at supporting projects for extraction, processing or recycling of raw materials that are of critical importance for transformation technologies. In this connection, we are continuing to take account of the needs of SMEs. As part of this focus, we are continuing to provide advising and support for SMEs with regard to a sustainable, resilient raw materials supply.

Our support for projects in this area could also include, for example, support for development and use of AI-based processes for identification and recovery of raw materials, or of parts and components that contain production-critical raw materials such as rare earth minerals. It could also extend to the development of new, circular-economy-based business models oriented, for example, to collection, reuse and reprocessing of products or components.

Also, raw materials projects, including projects focussed on recycling, are to be supported via a raw materials fund. It is to be funded via an equity instrument. The design of the raw materials fund is currently being worked out in detail. This work is being carried out in close cooperation with European partners, and with a close focus on the Critical Raw Material Acts (CRMA) that has been proposed by the European Commission.

Domestic mining operations play an important role in our raw materials supply. This is especially significant in that raw materials that we are able to produce in country are safe and reliable, and are produced in accordance with the highest ecological and social standards. The legal framework for such domestic extraction is provided by mining law. Currently, the Federal Government is preparing key points relative to modernisation of the country's mining law, with a view to facilitating domestic raw materials extraction and to making it ecologically compatible. To this end, it has been consulting with mining law experts, including law-school experts, and Länder-level lawyers charged with ensuring compliance with provisions of the Federal Mining Act.

With a view to strengthening national circular economy structures, the Federal Government is currently also preparing a national circular economy strategy (Kreislaufwirtschaftsstrategie – NKWS). The strategy is expected to be completed in 2024. The specific areas of activity being considered in this process include plastics, vehicles and batteries, ICT & electrical devices, metals, buildings, clothing & textiles, circular production processes, renewable-energies systems and public procurement. The relevant work is also taking account of proposals that have emerged from the German Mineral Resources Agency's (DERA's) dialogue platform for the promotion of circular economies. The

proposals have been developed over a two-year period, in the framework of the Federal Government's 2020 raw materials strategy. The proposals include such aspects as legally reliable definitions of the beginning and end of waste status, ways of improving separate storage of waste, and revision and updating of existing regulations and standards. Such proposals also serve the purpose of closely linking the country's raw-materials and circular-economy strategies.

To support financing of raw materials projects abroad, the Federal Government has expanded its untied loans guarantee programme (Garantieprogramm für ungebundene Finanzkredite – UFK). Now, a "climate UFK" is making it possible to support both raw-materials-only projects and projects focussed on precursor and processing products (such as battery cells, H2 and H2 derivatives), and thereby to further the supply of such products of importance for German industry.

The Federal Government continues to support the EU initiatives being carried out in the Green Deal framework, such as the EU Circular Economy Action Plan, under which the European Commission is seeking to promote sustainable resources use, via measures such as more-sustainable production processes, more-durable products and recycling. Such initiatives also include the EU Ecodesign Directive, and the aforementioned Critical Raw Material Act, which is designed to enable recycling and circular-economy programmes to contribute more effectively to the long-term reliability of the raw materials supply, especially with regard to strategic and critical raw materials (such as rare earth minerals). Our efforts in this area include working to ensure that circular-economy principles receive even greater priority.

2.3 Renewing our key strengths

We now need to marshal our country's strength for the task of renewing and modernising our industry with a view to the future. Safeguarding our industry means safeguarding the industrial base that makes us a strong industrialised country. German industry is at the heart of complex value chains that extend throughout all of Europe and on which millions of jobs depend. This applies to German industry's entire range of products, throughout a spectrum from raw materials to intermediate products and to end products. We want to uphold this breadth and diversity of our products. And we want to protect the pertinent value chains, because our prosperity depends on them and because they support our economic security.

Therefore, we need to develop German industry's successful business models in ways that will make them both climate-neutral and globally competitive in the future. The centrepiece of such efforts consists of a complete transition to climate-neutral production methods, in all industry sectors. That said, it goes without saying that we want this transformation to take place here in Germany. We want the climate-neutral products and production processes of the future to be developed and applied here. We want all of this for the following reasons: We want our value chains to remain intact; we want to safeguard and reinforce our supply reliability; and we want to protect our good jobs – so that Germany can maintain its technology leadership in centrally important areas and so that products Made in Germany remain in demand around the world.

This transformation process amounts to an enormous challenge. It will cost companies effort and money, because it will require them to invest in new production systems and to retrain their

employees. At the same time, it amounts to an enormous opportunity: In the markets of the future, those companies will succeed that make the fastest and best transitions to climate neutrality.

The responsibility for renewing our industrial value creation lies, first and foremost, with companies themselves and their employees. Many companies have already taken action in this area and prepared themselves for the future. The state also has a decisive role to play, however: It needs to establish a proper framework, and to support companies, with targeted funding, in converting their production operations. To these ends, the Federal Government has launched a large group of measures over the past 21 months, and additional steps will follow very soon.

With these efforts, we will place our prosperity on a new footing – and by decarbonising our industry, we will fulfil our international obligations under the Paris Agreement. On the one hand, these aims will require us to make fundamental changes in many production processes, in order to prevent greenhouse-gas emissions. Changes, for example, such as converting the energy source for glass production from natural gas to electricity and hydrogen, or powering steel production with hydrogen instead of coal. Or, in the chemical industry, converting plants to carbon sources other than fossil-based natural gas or oil. These challenges primarily apply to energy-intensive industry. We are addressing them with a broad mix of instruments – from the ETS, as the lead instrument, to funding programmes such as those under the climate-action agreements.

That said, some industries have to revamp their product ranges completely, because their products are not climate-neutral – not even when in use. This aspect is not only relevant for automakers.

This transformation presents economic challenges for industry: Currently, new climate-friendly technologies are often considerably more expensive than conventional, climate-harmful ones. In an industry context, climate action calls for decisive, determined action on the part of both companies and their employees. The state's role in this connection is to provide planning certainty, by defined clear pathways for transformation and offsetting competitive disadvantages.

a) ETS as a lead instrument

The overarching framework for our state actions in Germany is the European Green Deal, which is being transposed by European climate-action instruments. The European Emissions Trading System (ETS) is the lead instrument being applied on our pathway to climate neutrality. Via the ETS, the high damage costs tied to climate change are internalised – at least partially – and companies receive clear price signals: As CO₂ prices increase, CO₂ emissions become more expensive, and renewable energy sources become cheaper in relation to fossil-based energy sources. The ETS also creates market-based, economically efficient incentives for transitions and conversions to climate-friendly technologies, and for more-efficient energy and resources use.

With regard to its ETS, the EU is a global pioneer. While some other countries have introduced various forms of CO₂ pricing, major countries such as the U.S. have not yet indicated that they plan to introduce such pricing in the foreseeable future. As long as CO₂ emissions create few or no costs for companies in such countries, our companies will be at a competitive disadvantage. Such distortion of competition, resulting from differences of ambition relative to climate policy, can lead companies

to transfer their CO₂-intensive production into countries with no CO₂ pricing, with the result that CO₂ emissions increase in those countries (“carbon leakage”). Such effects neither benefit the European economy nor further global progress on climate action.

As of fall 2023, an EU-wide mechanism that addresses this issue – the Carbon Border Adjustment Mechanism (CBAM) – will begin entering into force, on a stepwise basis. Countries with no comparable CO₂-pricing systems can produce emission-intensive products at lower costs. As of 2026, imports of emission-intensive products from such countries will be subject to a CO₂ surcharge. This will mean that CO₂ emissions of certain energy-intensive products that are imported into the EU will receive a price.

The ETS has already been strongly driving electrification and energy-efficiency processes in industry. In many cases, however, it does not yet provide adequate incentives for the next necessary step: revamping of production processes at a fundamental level – for example, via use of hydrogen or CCS/CCU – with a view to making them compatible with climate-neutrality goals. When such incentives are lacking, “wait-and-see” effects can hold up needed investments. This occurs when companies refrain from investing in climate-harmful production processes – and also refrain from investing in new processes, because the new processes are not yet economically attractive. This is problematic in that a) major climate-oriented modernisations are urgently needed in many areas, and b) relevant new production processes now need to be tested at industrial scales so that they can become promptly available for broad use.

b) Funding programmes

We are addressing this issue with state funding programmes, a third area of action that complements CO₂ pricing and the Carbon Border Adjustment Mechanism. With such programmes, we are facilitating industrial transformation at the speed and depth we need if we wish to renew our industry, safeguard its long-term competitiveness and achieve our climate goals, all at the same time. We are supporting companies in Germany in developing, building and operating new industrial plants for the global market; plant engineers are developing new products for climate-friendly applications that are expected to be in demand worldwide. This is facilitating the emergence of completely new value chains in Germany – throughout a diverse spectrum ranging, for example, from hydrogen production to sales of electric cars produced via carbon-neutral manufacturing. At the same time, it is reinforcing strengths in areas in which German industry is already strong, and it is enabling us to gain market shares in new markets.

It is important to note that such funding programmes should not and cannot have the purpose of reimbursing, for all companies, all additional costs that are incurred via transformation to climate neutrality. Instead, our industry policy is designed to trigger a market transformation. As soon as the desired market transformation gets underway, the additional costs for climate-friendly industrial production will decrease – and the need for state support will also decrease as well.

The central instruments in this connection include the Carbon Contracts for Difference (CCfD) (“Förderprogramm Klimaschutzverträge” – KSV) funding programme, which the Federal Government launched after taking office and which is receiving funding in the tens of billions of euros. Carbon

contracts for difference enable industrial companies to invest in climate-friendly production facilities that would otherwise not be profitable (in areas such as the cement, paper, steel and glass industries). Two characteristics of the funding programme make it especially effective. First, the programme provides variable funding that is based on current CO₂ prices within the ETS and on current energy prices. Once the cost of climate-friendly production falls below that of its conventional counterpart, the payment flow is reversed, and the companies receiving funding then pay the difference (the pertinent additional revenue) back to the state. Second, programme funding recipients are selected via an auction procedure. Companies are required to submit bids based on the amounts of government funding they need in order to avoid one tonne of carbon dioxide with their transformative technology. As a result, only those companies that convert their production at the lowest cost are awarded a carbon contract for difference. In return, companies receiving funding are exempted from the usual documentation and verification obligations, obligations which can put an enormous burden on companies and entail costly and lengthy approval procedures. The BMWK has designed the new CCfD funding guideline to also be relevant for emission-intensive SMEs: the minimum emissions level for the conventional production facilities cited for reference purposes is only 10 kilotons of CO₂ per year. In addition, the guideline allows groups of operators of small facilities to band together in consortia.

A preparatory procedure carried out in summer 2023 has greatly exceeded our expectations. It showed that industrial companies in Germany stand ready, with highly innovative projects, to use new technologies to convert their production processes and make them climate-neutral. Many other countries, and the EU Commission, are now

preparing comparable instruments. Germany is the first country to be ready to operate in this regard, and we want to launch the first round of bidding in 2023.

The IPCEI Hydrogen programme (IPCEI = Important Project of Common European Interest) also provides support for innovative projects that help achieve climate neutrality. Important lighthouse projects in this connection are being carried out at steel mills of Thyssenkrupp and of Salzgitter AG (two projects in total). In the cities of Duisburg and Salzgitter, and working in cooperation with the states North Rhine-Westphalia and Lower Saxony, we are promoting initial production of green steel and thereby helping to develop a key climate-protection technology. Also, via the Decarbonisation in Industry programme, we are supporting model projects in various sectors, including the chemical, glass, steel and cement industries. In the coming years, more than 500 million euros will be provided for these projects, and other projects as well, in this framework. Currently, we are revising the programme in order to be able to fund even more innovative projects.

Efforts in this area do not always entail major investments in new systems, however. SMEs account for large swaths of Germany's industrial landscape. And many SMEs are already making important contributions to the decarbonisation-oriented renewal of our industry. In keeping with this insight, we are providing targeted support for SMEs undergoing early transformation. Under the Growth Opportunities Act, investment premiums are available for transformation technologies, in the form of direct tax breaks of 15 percent for energy-efficiency measures. Via the Federal funding programme for energy and resource efficiency in industry (Bundesförderung für Energie- und Ressourceneffizienz in der Wirtschaft – EEW), we

are providing annual funding of over 800 million euros for measures in the areas of energy efficiency, resource efficiency and technology conversions.

The Federal Government has also taken relevant action in the area of foreign trade promotion, by providing support for German exporters and investors in target markets, which are often highly vulnerable to climate-change impacts. Under the new climate action strategy, and its sectoral guidelines, the Federal Government's guarantee instruments for foreign trade promotion are now oriented to a net zero pathway with a target year of 2050. Via improved funding terms, compatible with the 1.5-degree goal, export and investment incentives are being provided and being secured against economic and political risks entailed in international business.

c) Green lead markets

As important as our funding programmes currently are, with regard to climate action and German industry, we still need to do everything in our power to make them unnecessary in the medium term. In some areas, climate-friendly industry is already profitable without state support. This situation has to change so that climate-friendly industry can be profitable without state support in all areas. CO₂ pricing and the Carbon Border Adjustment Mechanism are playing a central role in this connection. Plans call for these efforts to be complemented by an additional instrument: Creation of green lead markets for feedstock and raw materials, such as steel, cement and ammonia, in which companies can sell their climate-friendly products at higher prices (with the help of "green premium") than they would otherwise achieve. In a first step in this regard, we are joining with stakeholders to define requirements for climate-friendly production via which feedstock/raw materials

would be deemed to be climate-friendly. We plan to present the results of this effort this year. In a second step, we plan to introduce a voluntary labelling programme. It would provide standardised designations that companies could apply to their climate-friendly products and use in their advertising.

At the same time, we want to enhance the attractiveness of climate-friendly products by having the state commit to prioritising climate-friendly products in public procurement. We expect climate-friendly products to become standard in Germany by no later than 2045 and standard at the European level by no later than 2050. The lead markets cannot become established in Germany, however, unless some companies begin producing climate-friendly products and then, with the expertise they gain thereby, help define the requirements pertaining to such products and help establish the first value chains in this area. Consequently, initial support plays an indispensable role in the establishment of green lead markets. In the medium term, earnings with green products will grow, with the help of green lead markets, and funding requirements will decrease.

d) CCS/CCU

Finally, we also need to develop new technologies for the climate-neutral renewal of our industry. According to the Intergovernmental Panel on Climate Change (IPCC), the climate protection technologies needed for such renewal include carbon capture and storage (CCS) and carbon capture and utilisation (CCU). Germany will only be able to attain its climate neutrality targets if it also uses CCS/CCU. The use of CCS is primarily necessary for those areas in which there are no or hardly any technical possibilities to cut emissions.

Now, following decades of research and testing, CCS technology is being reliably and safely used in some EU countries (primarily North Sea states) and in some industrialised countries outside of Europe. In some cases, it is also being used at industrial scales. Norway is now operating two large-scale storage sites for CO₂. Denmark, the Netherlands and the UK have begun developing CO₂ storage sites and have started to establish relevant industrial applications. Also, the U.S. and Canada have decades of experience with CCS technology. At the European level, a directive dating from 2009 governs the safe, environmentally compatible use of CCS/CCU. A number of European funding instruments for industry decarbonisation are aimed at bringing this technology to industrial maturity. The EU Commission's recent proposal on the Net Zero Industry Act is aimed at providing additional impetus, throughout Europe, for expansion of the CO₂ transport and storage infrastructure.

The Federal Government will therefore present a carbon management strategy which makes possible the use of CCS and CCU and gives support to some aspects of these technologies. This also means setting up the necessary transport infrastructure in Germany and working with the European partners to find a common storage strategy.

e) Mobility industry

In the climate-neutral renewal of our industry, special attention is being given to the German industry sector that employs the most people and generates the most revenue: vehicle construction – in particular, the automotive industry and its suppliers.

The transformation of the automotive industry is in full swing. At the same time, competitive pres-

asures are growing at the international level. In the U.S. and China, new competitors in the area of electromobility have emerged.

In the automobile sector, it seems likely that battery-powered electric cars are the wave of the future, although other automotive technologies can be expected to co-exist in the market with them. In all likelihood, the automotive market will thrive via a) ongoing innovation in battery technology and b) the low electricity costs renewable energies are expected to make possible. For this reason, it is vitally important for the German automotive industry to be among the leaders in the relevant competition. And the German Government is providing decisive support for industry in this area. In cooperation with industry and the unions, we have defined and proclaimed the strategic goal of having 15 million all-electric battery-powered automobiles (BEV) in the country's vehicle fleet by 2030. The importance of this goal is not limited to climate policy. We also intend for it to boost investments in electromobility in our home market and to safeguard value creation in Germany's automotive sector. As it happens, electromobility's share of the German market is already high by both European and international standards. Nonetheless, more must be done, if we are to reach our strategic goal. As electromobility continues to ramp up in Germany, the Federal Ministry for Economic Affairs and Climate Action (BMWK) plans to continue monitoring and supporting this process, and to continue proposing additional relevant measures as necessary.

From 2023 to 2026 alone, the BMWK is providing over six billion euros of support for the automotive industry as it transforms itself in keeping with the new mobility technologies. The relevant support measures include a "Future-oriented investment programme for automotive manufacturers and

suppliers" (Zukunftsinvestitionsprogramm für Fahrzeughersteller und -zulieferer), funding for regional transformation networks and transformation hubs, the funding programme "New vehicle and systems technologies" (Neue Fahrzeug- und Systemtechnologien) and an electromobility funding programme (Förderprogramm Elektro-Mobil). The programmes address such aspects as production conversions oriented to electric vehicles, the development of a European battery ecosystem, and competence building in the areas of automotive digitalisation and automotive production. Currently, new production capacities are being developed throughout the value chain in Germany. These include BASF's new cathode active materials production plant in Schwarzheide, and Northvolt's planned battery factory in Heide. Rapid expansion of the charging infrastructure, oriented to the establishment of a complete-coverage infrastructure in line with demand, is playing a key role in the electrification of the transport sector. The Federal Government's aim in this regard is for one million public charging points, available on a non-discriminatory basis, to be in place by 2030. In the process, priority is being given to fast-charging stations. Germany's industrial and technological strengths have always included its extensive automotive ecosystem, including its automakers, its large and small suppliers, its research institutes, its universities and its highly trained workforce. Now, it is vitally important that this ecosystem be safeguarded and enhanced for the future, via transformation of the entire automotive sector.

Other areas of vehicle construction are also undergoing transformation. We want to protect the industrial strength of the German aviation industry – and, at the same time, undertake to achieve the highly ambitious technological aim of making it climate-neutral. The aircraft of the next generation and beyond need to be significantly more efficient,

yes, but they must also offer perspectives – for example, through use of hydrogen – for complete decarbonisation of air transports. The Federal Government is actively supporting the aviation industry on its path of technological transformation. For example, via the LuFo Klima aviation-research programme it is currently providing research funding of 465 million euros per year.

Germany's maritime industry, with annual revenue of about 50 billion euros and a workforce of up to 400,000, is also one of the country's most important economic sectors. Via its maritime research programme, the BMWK provides some 90 million euros of annual support for R&D projects of the country's shipbuilding and maritime supply industry, in the areas of ship technology, navigation, marine technology and maritime production. In the future, German shipyards will play a key role in connection with accelerated expansion of offshore wind energy, as indispensable production sites for the new generation of 2-GW converter platforms required for connection of offshore wind farms.

E. Outlook



This exposition of the BMWK's industry strategy is intended to serve as an aid in understanding the Federal Government's industry policy, along with its overall strategic context and its integration within Germany's social market economy. At the same time, it seeks to outline the efforts that we need to make in the interest of our industry – and, therefore, to provide impetus toward a bright future for our industry.

At a BMWK industry conference scheduled for 31 October 2023, we plan to discuss the strategy in the context of the Alliance for the Future of Industry (Bündnis Zukunft der Industrie), with associations, unions, and policymakers from Germany, Europe and our allies from around the world. This event is expected to serve as a first important milestone in the ongoing discussion regarding the strategy.

In the two years remaining in the current legislative period, we need to make every effort to implement the relevant measures that have already been

initiated, and to quickly achieve viable agreement on key open issues such as the bridging electricity price.

At the same time, it must be remembered that the horizon for an industry strategy has to be longer than a single legislative period. In fact, implementation of this strategy, as a means of safeguarding Germany's industrial future, of renewing our prosperity and of strengthening our overall economic security, will be an ongoing policymaking task throughout the entire "bridge" decade that lies ahead of us.

For this effort, we will need to muster all of our strength and all of our patience. But our effort is very much worth our while – it is an effort aimed at ensuring that Germany remains a strong industrialised country.

