COMMERZ REAL

Part 2
OF OUR
3-PART SERIES

Connected with the climate

Infrastructure and energy

Whitepaper — 02.2025

Henning Koch
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Foreword

Dear Readers,

Here at Commerz Real, we ask ourselves the following fundamental question: what does a future look like in which we as humans want to live? When viewed in its entirety, the topic of infrastructure represents one of the crucial aspects in terms of sustainably networking and designing environments. It forms the basis of our communities and links the major issues of our time, such as energy supply, urban development and safeguarding prosperity.

Despite the social, political and economic challenges of recent years, infrastructure transformation is increasingly gaining momentum – and in Germany, for example, there is currently a huge need for investment.

The reliable expansion of roads, railways, waterways, electricity supply and telecommunication networks benefits everyone – the state, citizens and companies.

Innovative excellence and a network of strong partners are needed to make this happen. At Commerz Real, we focus on established technologies and assets. In recent decades, we have developed comprehensive expertise in the areas of property and renewable energies – two key segments with exceptional relevance for all aspects of infrastructure. It has long been clear that property and renewable energies are inexplicably linked, which is why we need to develop holistic approaches tailored to people’s needs. These approaches support us on the journey to net zero and open up new income streams.

As we are aiming to provide a comprehensive picture of the global infrastructure market in this white paper, we have produced a three-part series. This first part examines the changing market and the opportunities it offers to institutional and private investors. Part two explores the influence of infrastructures on the energy transition, whereas part three centres on how they affect people and cities.

I hope you discover exciting and structured insights.

Best wishes,
Henning Koch

Contents

The key to a successful energy transition

The transition to renewable energies requires development and expansion in almost all areas of energy provision. We provide an overview of the energy market in all its aspects and venture an outlook on the future.

Attention

You consume energy!

Without you even doing anything, your body consumes 2,000 kilocalories just to keep you alive. If you attempt to read and understand this text, you consume a little bit more energy; if you then do some Internet research to check whether these claims are true, your search requests on global servers consume yet more energy. You can find out how much online, but – as explained – this also involves consuming energy.

Taken from: Erneuerbare Energien zum Verstehen und Mitreden, C. Holler et al., 2021

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Everything starts with energy.

Energy is life.
Nothing can happen without energy. Global hunger for energy has become almost insatiable – and with the world's population continuing to grow and many countries aiming to catch up, sustainably meeting this demand poses a challenge.[1] Instead of falling demand for primary energy, a current report published by the Global Carbon Project this year indicates that carbon emissions are 0.8 per cent higher than in 2023, reaching a concerning record high of 37.4 billion tonnes.[2]

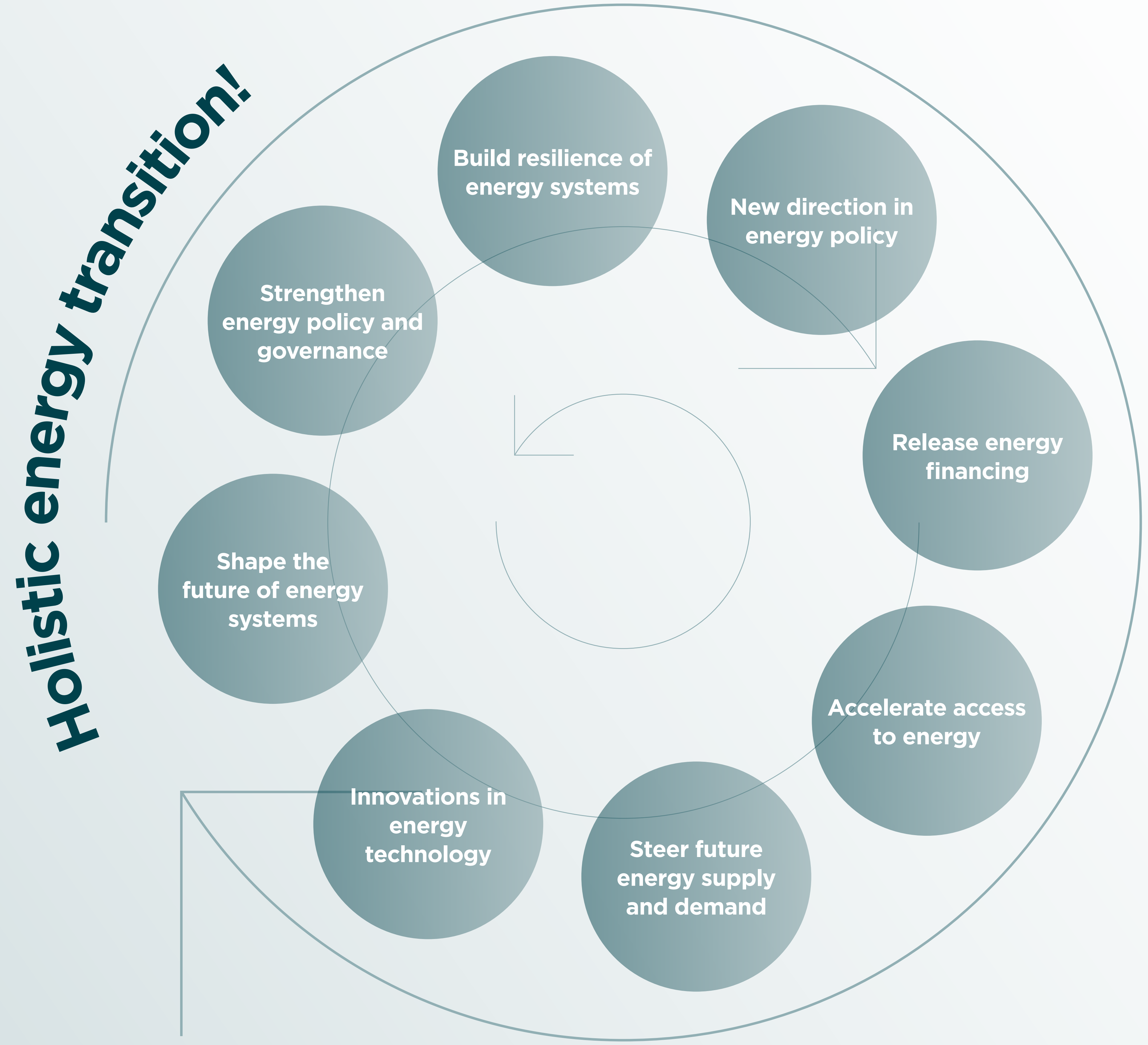
Energy is global.
Energy consumption and generation account for roughly two thirds of global greenhouse gas emissions. 81% of the global energy mix is based on fossil fuels – a situation that has remained unchanged for decades.[3]

Energy is political.
Conflicts in the Middle East and Russia's war in Ukraine have called attention to some of the world's key energy-producing regions. While the acute impacts of the global energy crisis have abated, this geopolitical uncertainty reveals the fundamental weaknesses of the global energy system.[4]

Energy is unfair.
The energy infrastructure is becoming increasingly exposed to risks associated with climate change. All too often, it is the poorest in society, especially in emerging and developing countries, who bear the brunt of these crises. The greatest injustice in the field of energy is that fact that hundreds of millions of people, especially in Africa, still do not have access to basic energy services such as electricity and safe cooking stoves.[4]

Energy is challenging.
In our rapidly changing world, the notion of energy security goes far beyond protection against the traditional risks of oil and natural gas supply.[5]

Energy is now.
A transition is urgently required to a more comprehensive, sustainable, affordable and secure global energy system. It is about striking a balance between security and access, environmental sustainability and economic development. This has to be achieved in a way that pays due regard to the impacts of considerable geopolitical tensions. The response of politicians and the private sector can influence the speed and nature of the energy transition towards a zero-carbon future in the years ahead.[6]



Source: World Economic Forum/Strategic Intelligence

See page 23 for an explanation of references

Status quo of the energy transition.

One key aspect of the energy transition is to decarbonise electricity generation by switching from fossil fuels to renewable sources of energy. Renewable energy generation has been further expanded in recent years. In 2023, for instance, renewable energy sources accounted for more than half of gross electricity consumption in Germany.[7] However, there is still much work to be done:

1 Germany has committed to climate neutrality by 2045.

Exponential growth of climate technologies needed by 2030

100x carbon capture, use and storage

200x hydrogen electrolysers

6x wind energy

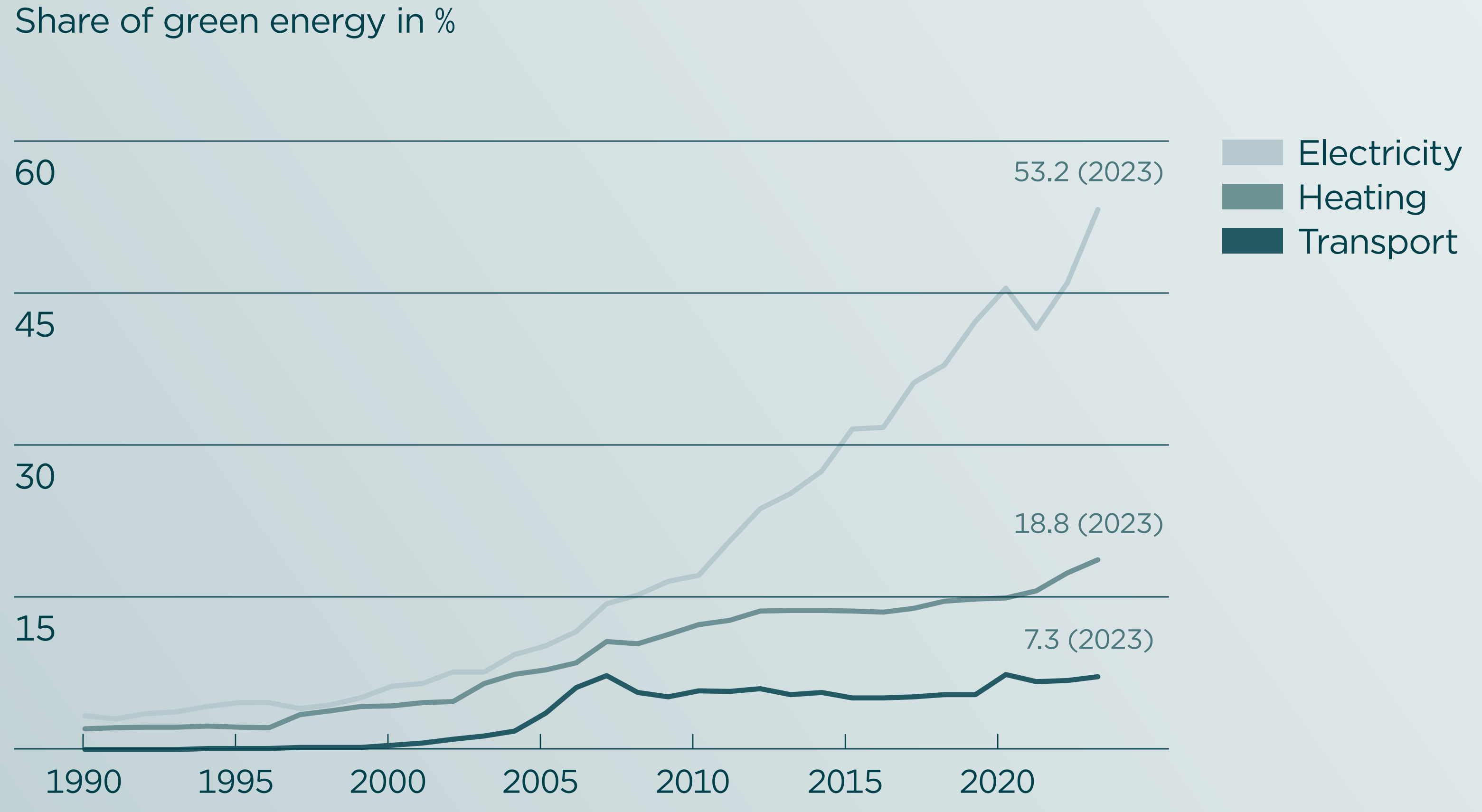
14x solar energy

14x EV sales

Source: McKinsey & Company, Scaling green businesses: Next moves for leaders, March 2023 Green energy business: The next moves for leaders | McKinsey

2 The share of renewables in energy consumption for heating and in transport is much lower.

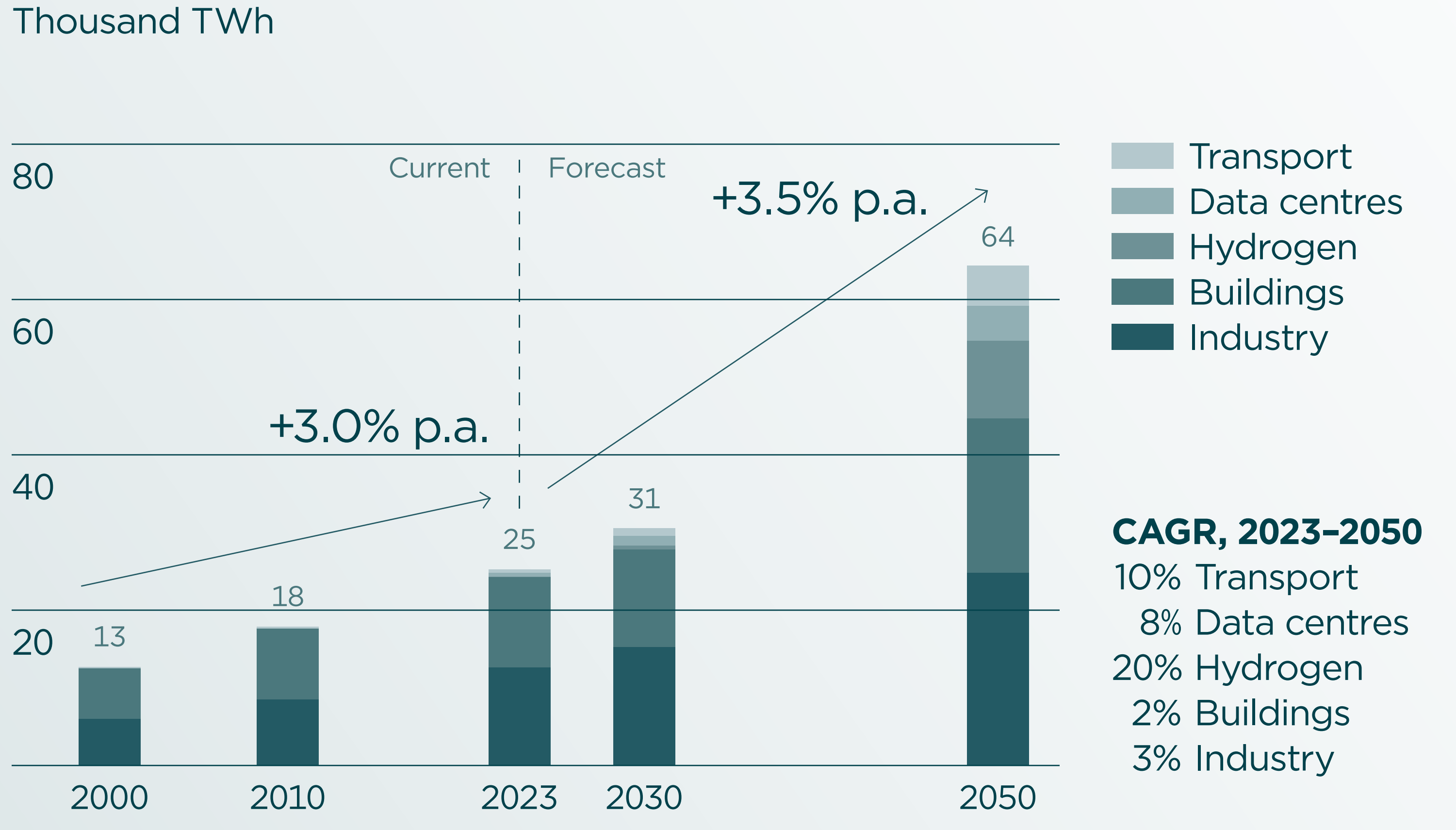
Development of the share of renewable energies in the sectors of electricity, heating and transport



Source: EY Fortschrittsmonitor 2024

3 The forced electrification of road traffic and heating supply will – alongside digitalisation and AI – significantly increase electricity consumption.

Global electricity consumption by sector, sustained momentum



Source: McKinsey & Company, Global Energy Perspective 2024, September 2024

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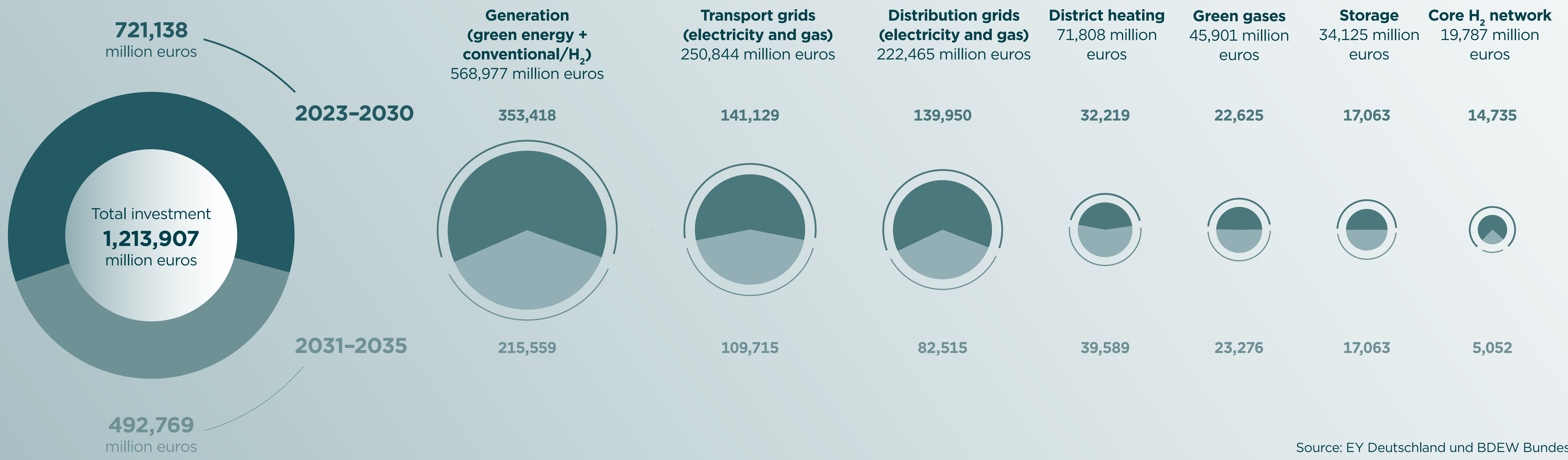
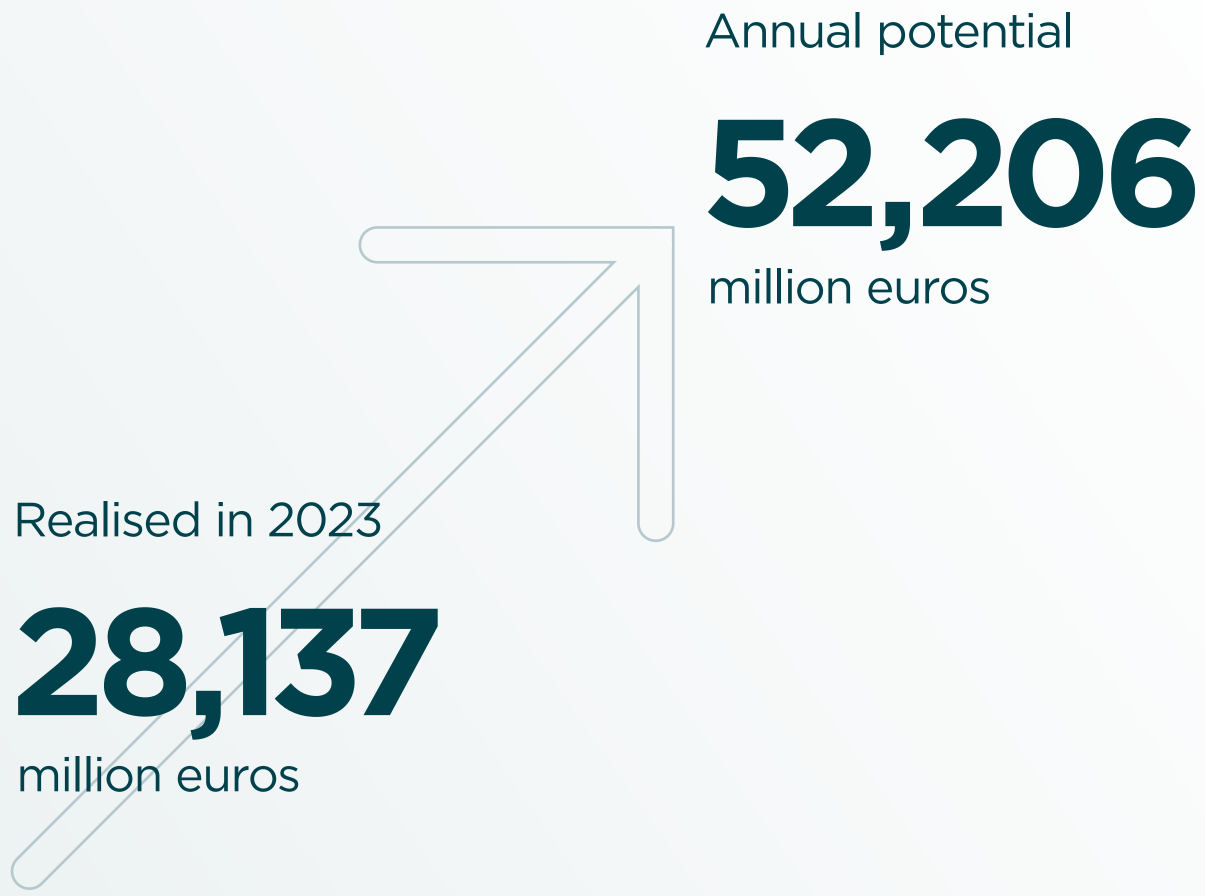
Investment volume required to achieve the targets of the energy transition by 2030 and 2035



Investment drives growth



Source: EY Deutschland und BDEW Bundesverband der Energie und Wasserwirtschaft e. V., Fortschrittsmonitor 2024 – Energiewende, April 2024

Germany must invest.

Energy transition needs considerable investment. Substantial investment is required in order to achieve the energy transition targets in Germany. The progress monitor of EY Germany and industry body BDEW indicates the following figures: 721 billion euros by 2030. At 49%, expanding electricity generation accounts for the largest share. A further 41% relates to the expansion of energy grids. Further investment will be needed from 2031, with the estimated expenditure by 2035 amounting to 439 billion euros.

Investment drives growth. The investment needed by 2040 could trigger gross value added of more than 52 billion euros per annum, which represents 1.5% of total value added in Germany. The gross value added actually triggered by the energy transition in 2023 is estimated at over 28 billion euros. As a result, 54% of the annual potential was realised, which is primarily due to the expansion of electricity generation and grids completed in 2023.

More momentum is needed. The actual/target comparison for 2023 shows that the potential value added for the year was not fully harnessed. In order to maximise existing potential, what is needed most is increased investment in the areas of electricity generation and grid expansion. Further drivers are needed through the expansion of district heating, the core hydrogen network and energy storage.

Investing with more energy.

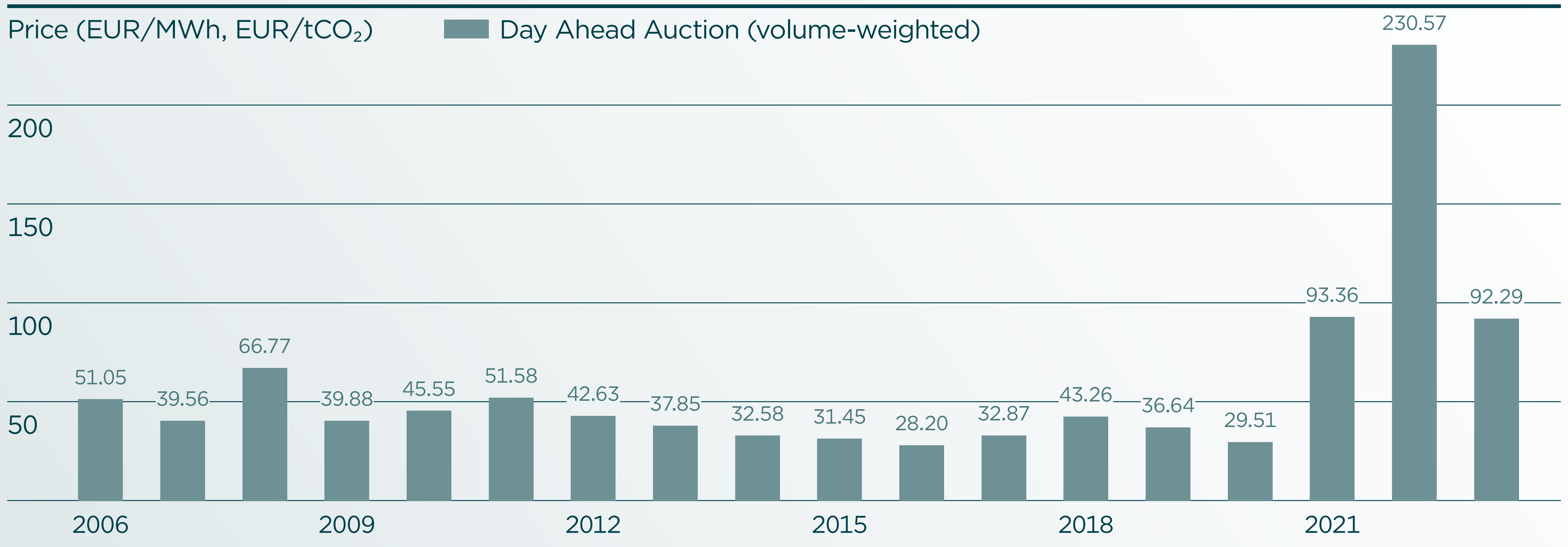
Challenging situation.
Investments in making the energy transition happen currently represent one of the most dynamic and promising areas of the infrastructure segment. However, the market environment has not been without challenges in recent times: high interest rates have resulted in rising financing costs and, in some cases, lower valuations due to higher discount rates. Moreover, higher returns in other asset classes have been catching the eye of investors. Interest rates have once again fallen, however, and many experts expect central banks to lower their base rates still further.

In some cases, inflation has led to sharp rises in (raw) material and construction costs. After electricity prices skyrocketed to new record levels, not least due to the war in Ukraine, they have since fallen again on average, albeit to a high level when compared over many years. Overall, the market conditions have been somewhat volatile in recent years.[8]

Promising investment.
On the other hand, the long-term opportunities are considerable: the political will and the environmental necessity of further transforming electricity and energy supply are still there, resulting in specific investment opportunities.

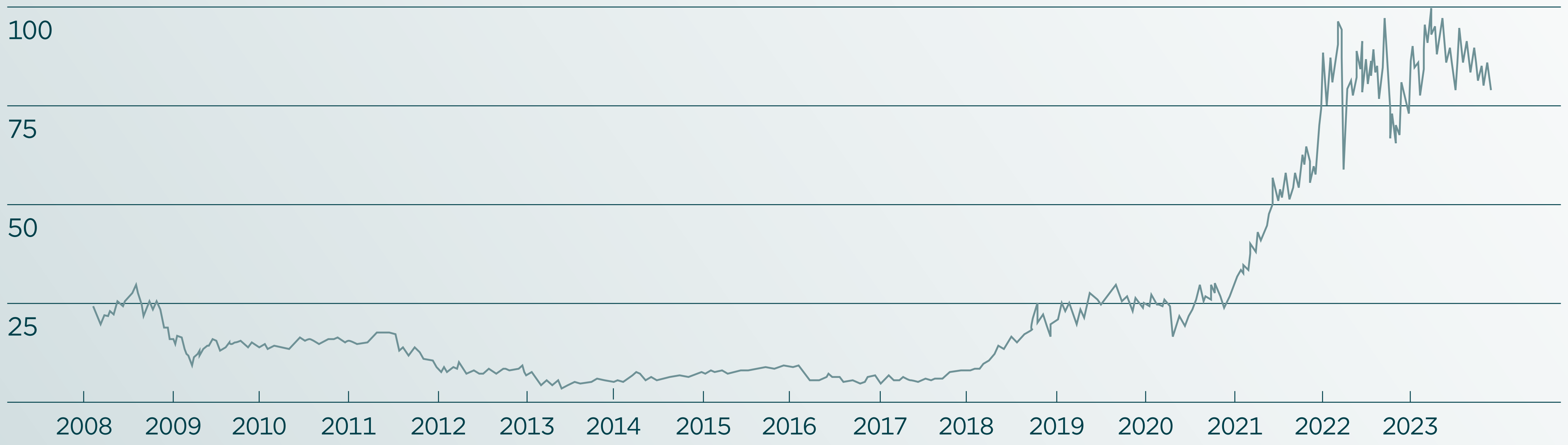
One example is the artificial shortage of carbon emission rights in the European Union, which has led to a rapid increase in prices since 2020. As a result, the consumption of fossil fuels is inevitably becoming more expensive, increasing the appeal of renewable energies.[9]

EPEX Spot Price Day Ahead
Volume-weighted, not adjusted for inflation



Source: Fraunhofer ISE, Stromerzeugung in Deutschland im Jahr 2023, June 2024

Price developments for emission allowances (EUA) since 2008



Source: ICE, Refinitiv Eikon, Darstellung Deutsche Emissionshandelsstelle (DEHSt), as of: 30 October 2023

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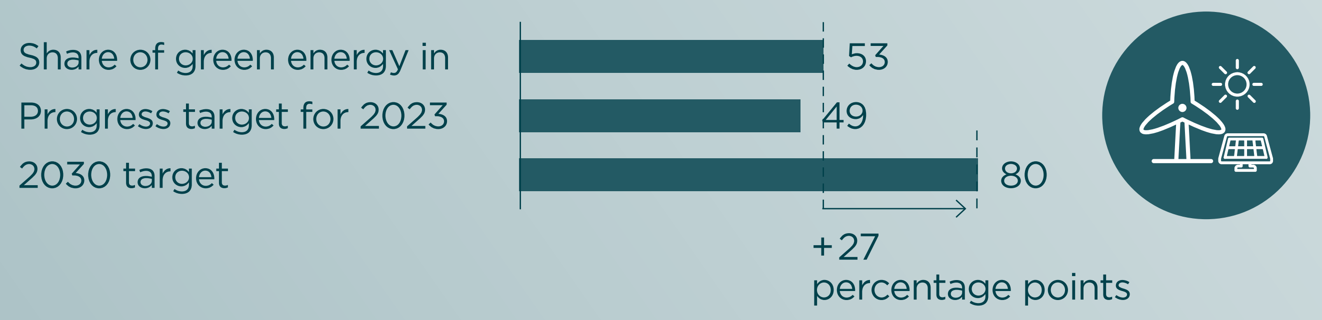
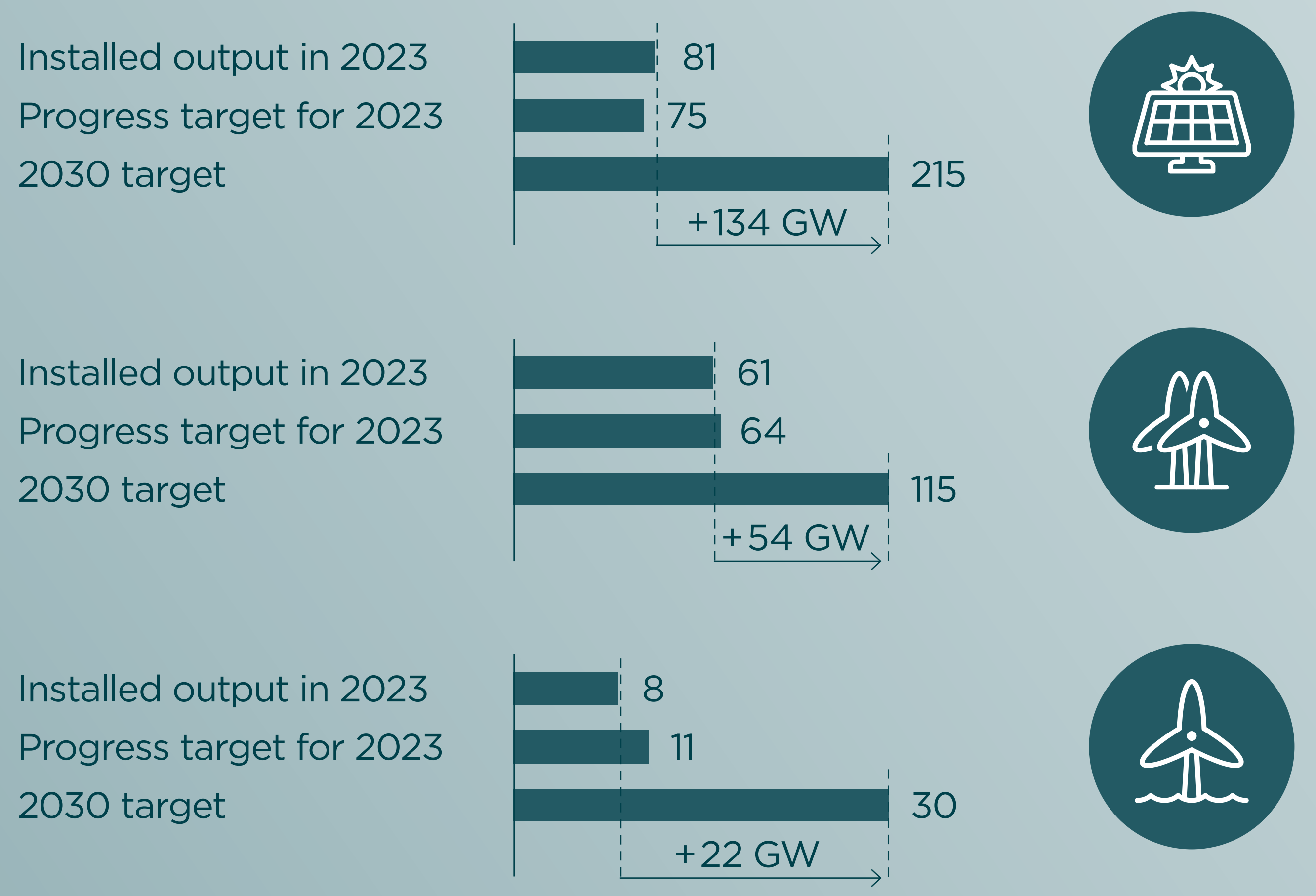
Sun, wind and future.

Share of renewable energies in meeting electricity consumption (%)

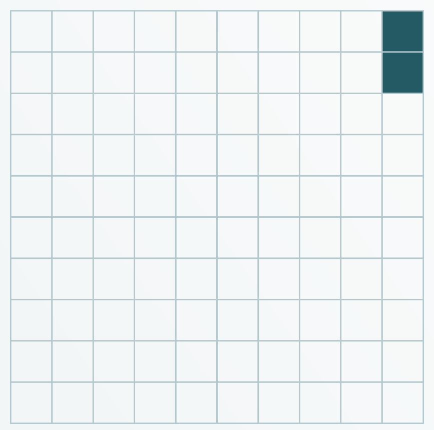


Installed renewable energy output in electricity generation (GW)



Source: EY Deutschland und BDEW Bundesverband der Energie und Wasserwirtschaft e. V., Fortschrittsmonitor 2024 – Energiewende, April 2024

Expansion targets for wind power in Germany



2%

By 2023, 2% of land in Germany (7,168 km^2) should be allocated.

Source: Federal Foundation of Baukultur, June 2024

The energy transition needs to be ramped up.
Globally, solar and wind represent the major levers in terms of renewable energy generation. In Germany, the construction of new solar panels stands at 13.6 GW and is therefore almost double that of the prior year – and is well above the target of 9 GW. The expansion of onshore and offshore wind energy comes in at 3.3 GW and 0.3 GW respectively; while this is also up on the previous year, it is well short of the expansion targets. In order to remain on the intended course, new construction of onshore wind energy needs to increase by a factor of 1.7, whereas a factor of 9 is needed for offshore wind energy.[10]

Fresh legislative wind.
The underlying legal conditions in the energy generation sector have improved considerably compared with previous years, leading to a more upbeat mood in the ‘approvals climate index’, which is now medium. The moderate increase in land allocation for onshore wind turbines and a steep climb in calls for tender and awarded contracts point to a potential acceleration of renewable energy expansion in the years to come.[10]

Step-by-step progress
Despite the current progress, there remains substantial room for improvement, especially when it comes to the lengthy planning and approvals process, which is considerably slowing down the rate of renewable energy expansion. It is equally important to promote acceptance of the energy transition through targeted measures, thus effectively removing hurdles at a local level.[10]

See page 23 for an explanation of references

Switching to renewables – what now?

A holistic view of the energy transition.
The energy transition can no longer 'just' be reduced to the expansion of generation capacities for wind and solar power. In fact, this narrow and conventional perspective is reaching its structural limits – a problem that needs to be solved in an environmentally friendly and socially acceptable way.

- In many places, grid capacities are reaching breaking point, with expansion costing time and money.
- The base load capacity needs to be increased using storage capacities.
- Energy-intensive industries need to switch to hydrogen, but capacity expansion is still in its infancy.
- Available sites for new onshore wind farms are scarce.

On their own, the successful methods of the past 20 years are no longer enough to meet the challenges of the next ten to 20 years. While the previous investment cases will not cease to be legitimate, there is a need for intelligent solutions offering investors new opportunities – with attractive potential returns – beyond the beaten track in the years ahead.

Extension and greater differentiation of the asset class 'energy infrastructure' will enable more pronounced capital allocation within this segment and, therefore, a broadening of revenue streams.

Further increase in the speed of expansion required (solar and wind)

Storage systems are increasingly needed, essential from 50% share of renewable energy[11]

Integration of fluctuating renewables into the energy system and **coupling** with other sectors (heating, mobility)

Grid expansion must be accelerated. (focus on north–south line) + EU grid integration (interconnectors), joint electricity market design

New business models and innovations
To implement new technologies and applications in an economically attractive manner.

International cooperation
To optimally harness the geographic suitability of individual energy sources, incl. the settlement of energy-intensive industries in places favourable to green energy generation.

See page 23 for an explanation of references

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7 Potential solutions

... and associated investment opportunities, which we examine in more detail on the following pages:

1 **Hybridisation**

2 **Battery storage**

3 **Hydrogen**

4 **Repowering**

5 **Offshore**

6 **Grids**

7 **Sector coupling**

1 Hybridisation

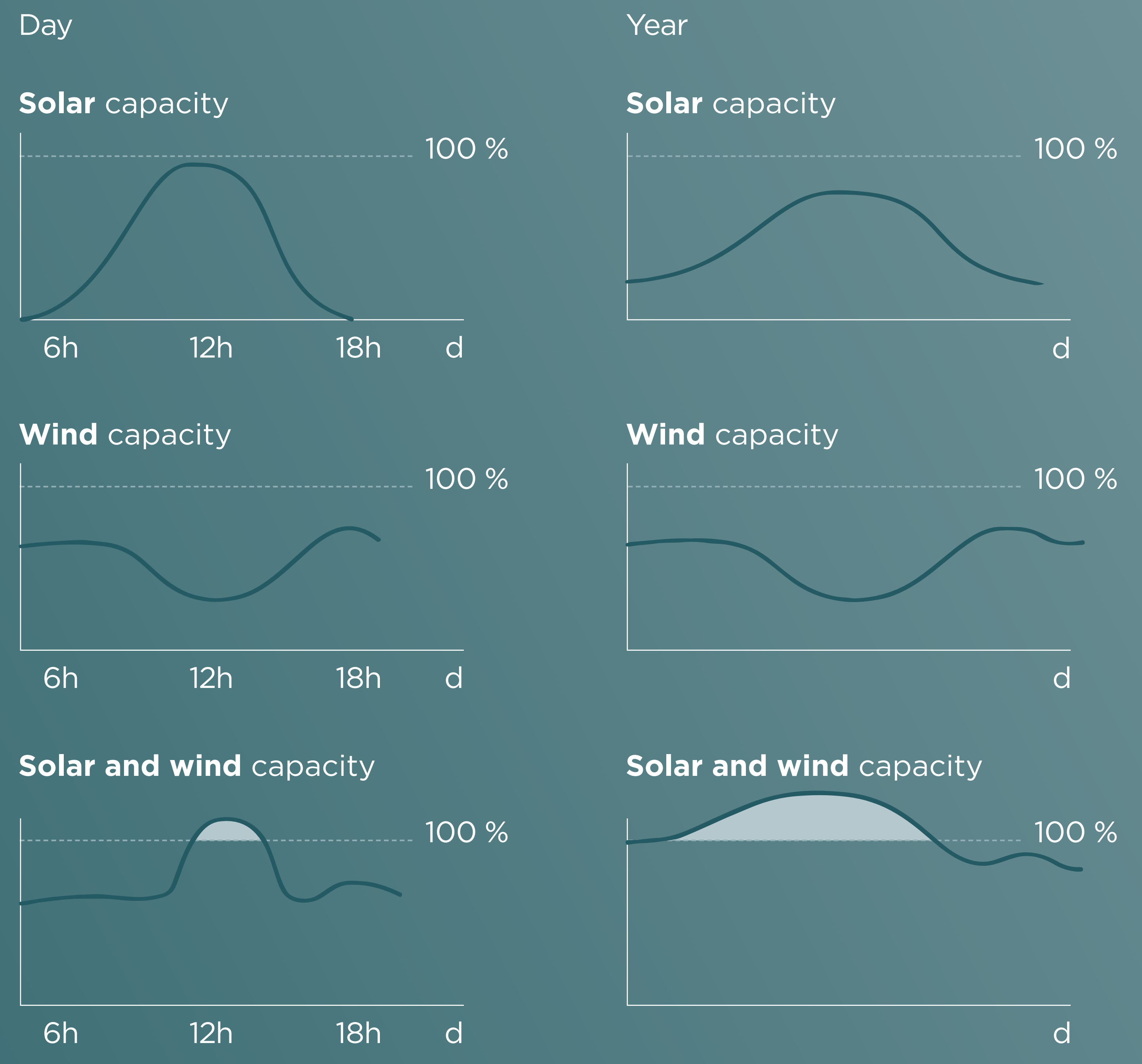
Solar, wind and storage: greater hybrid productivity.

Hybridisation of generation equipment.
The transmission grids currently constitute a bottleneck in the continued expansion of renewable energy generation. This doesn't just apply to high-voltage lines, so-called 'electricity highways' covering long distances, but also to local low- and medium-voltage grid connections. On the other hand, both wind and solar parks exhibit highly fluctuating generation profiles, depending on the time of day and the season, as well as the location and weather conditions.

This means that the local grid connections of the facility concerned are not used at their full capacity for longer periods of the year and – at other times – are overloaded and unable to fully feed in the electricity generated. It therefore makes sense to use the corresponding grid connections more efficiently by combining multiple, non-correlating generation methods, such as wind and solar. By 'levelling out' generation profiles in this way, overall grid stability is also improved and capacity expansion opportunities are opened up that would otherwise be hampered by a lack of grid capacity. In addition, a more stable generation profile makes it easier to market the electricity by means of long-term power purchase agreements (PPAs).

An equally efficient version involves supplementing an existing facility with a battery storage system that absorbs generation peaks and feeds them back into the grid when power generation is low and/or the spot price is especially high.

Schematic generation profiles of solar and wind energy facilities



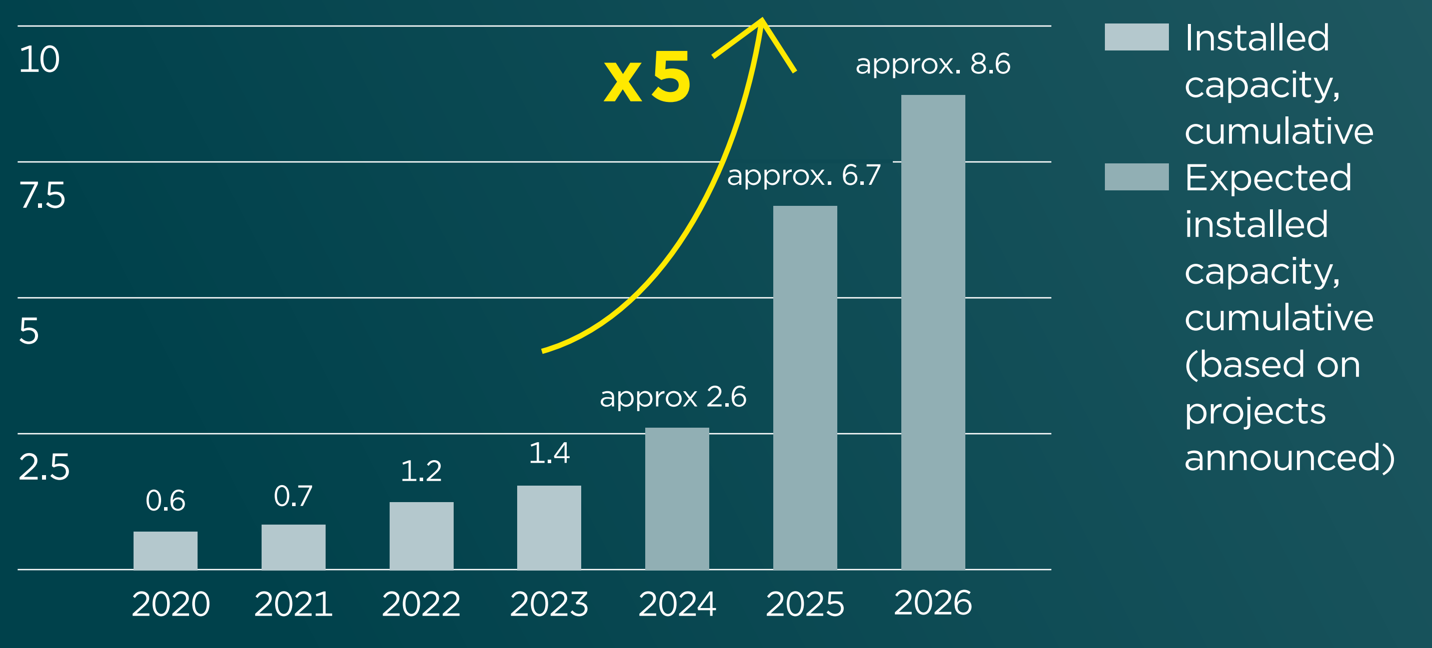
Source: own chart

2

Storage solutions

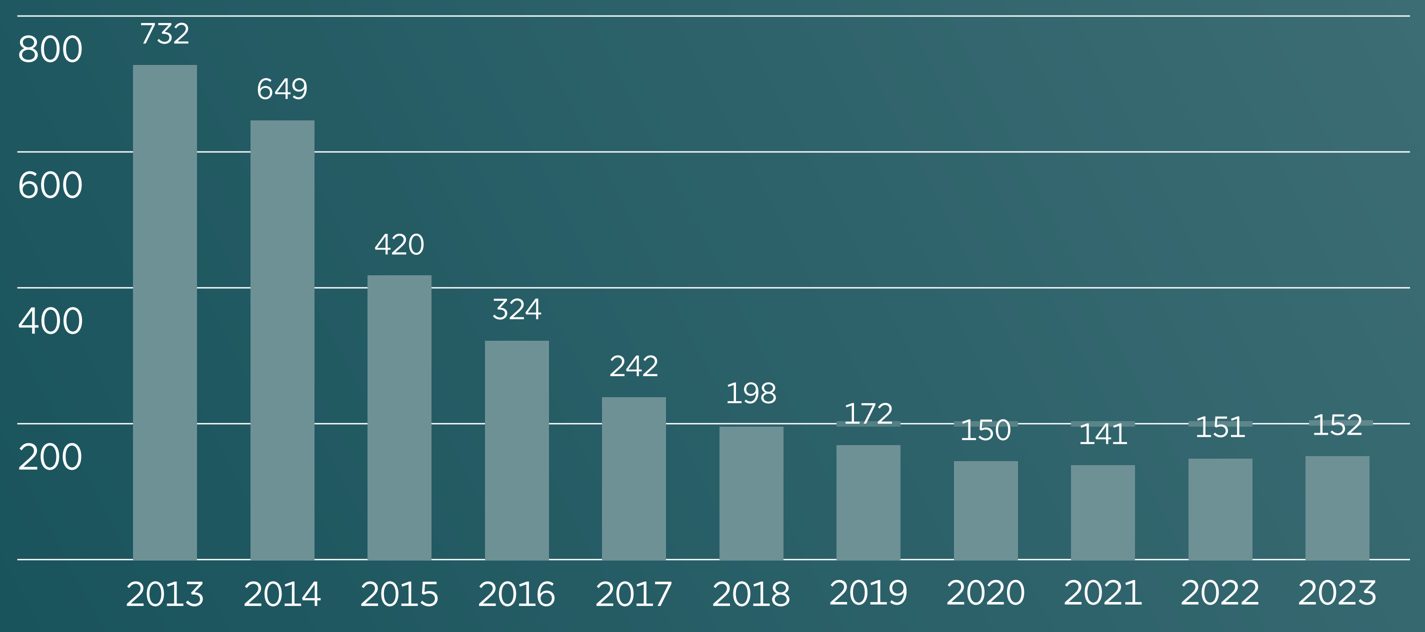
First aid for fluctuating generation.

Planned large battery storage systems
Fivefold capacity increase expected in two years



Source: Bundesverband Solarwirtschaft e.V., October 2024

Global price development for lithium-ion batteries in selected years from 2013 to 2023



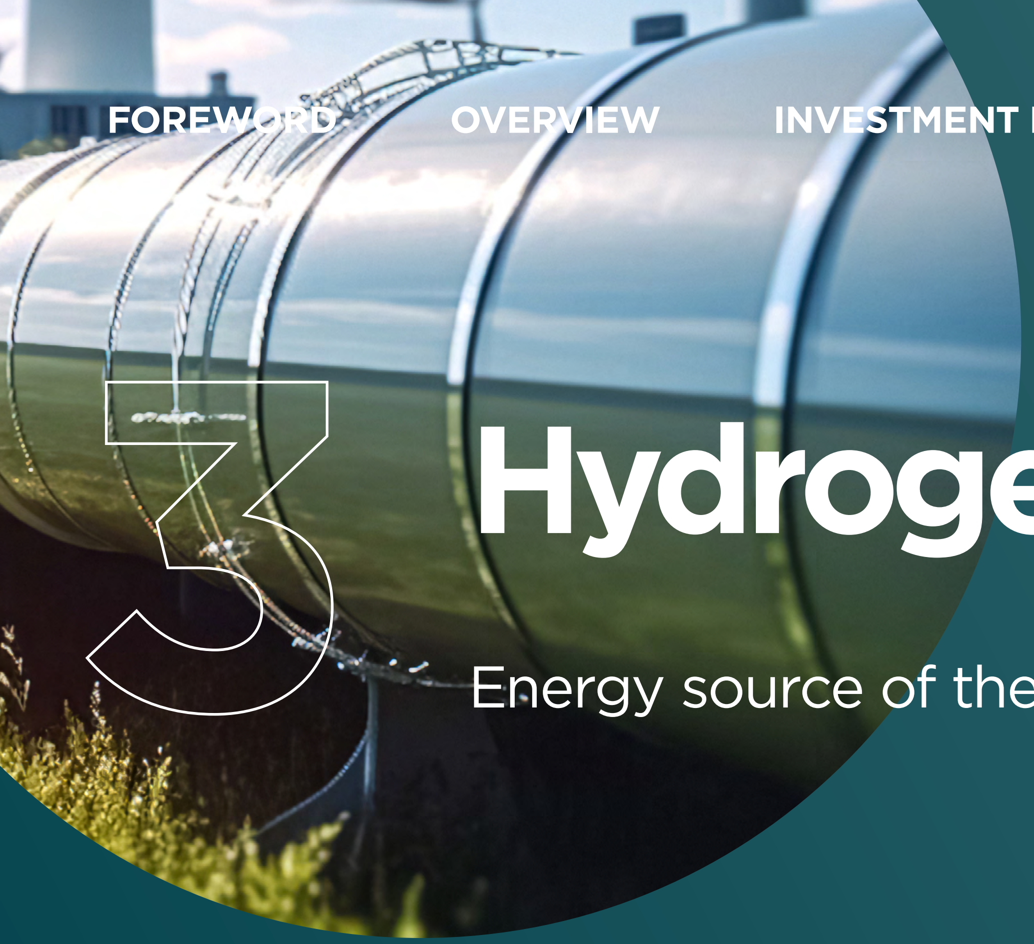
Source: Roland Berger and RWTH Aachen University, Battery Monitor 2023, 2023, Batteriemonitor_2023_digital.pdf

Lowering volatility. Reducing electricity prices.
In future, battery storage systems will play a crucial role in terms of feeding the power generation profiles of renewable energies into the power grid more evenly, utilising grid capacities more efficiently, contributing to a base load capacity of renewable energies and feeding in and marketing the power generated in closer alignment with market needs. Overall, they will lower the volatility of generation profiles and electricity prices alike.

For a long period, battery storage systems for renewable energies were viewed as too complex, too intricate and, most of all, too expensive to be used at scale. Thanks to technological advances and the huge growth in production capacity, chiefly for the global use of electric vehicles, prices per kWh have fallen sharply; for lithium-ion batteries, for instance, they decreased by almost 80 per cent to $152 between 2013 and 2023.

Fitting solar and wind parks with battery storage systems not only enables production peaks to be absorbed with great flexibility – and fed back in during slack periods – but also makes it possible to wait out low-price phases on spot markets and delay marketing the electricity until prices are higher. Unlike pumped-storage hydroelectricity, for example, the required construction work and interference in nature and the landscape are relatively minor, which also improves local acceptance.

According to the German Solar Association (BSW-Solar), there could be a fivefold increase in the installed capacity of large battery storage systems in Germany in the next two years. This is based on the most recent market analysis of consultancy firm Enervis, produced on behalf of the association.



3 Hydrogen

Energy source of the future.

‘Hydrogen is not an economic project, but a political one. I don’t like that.’

Hans Fredrik Forssman, Skandia Mutual Life[12]

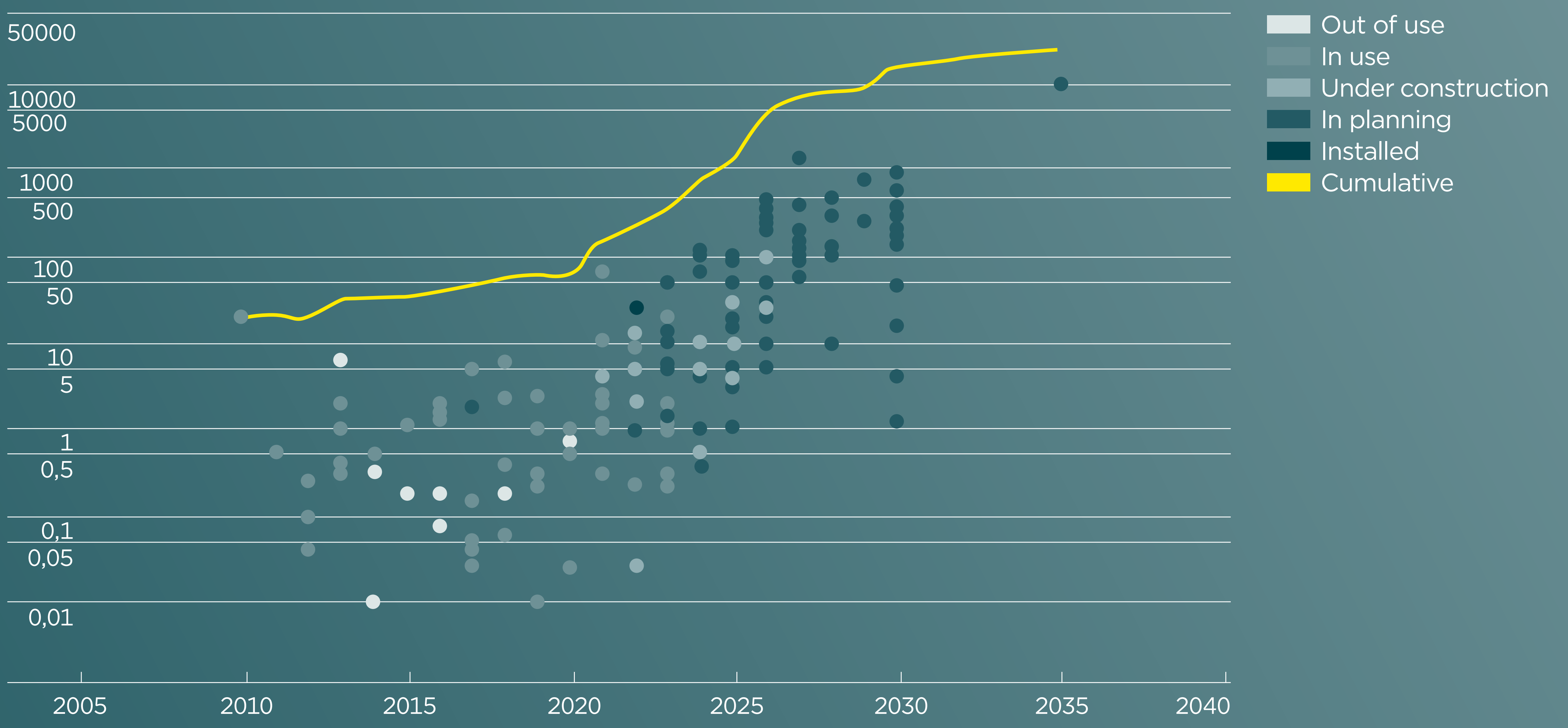
Great potential. Great need for investment.
It is widely expected that hydrogen will be a key component of tomorrow’s energy mix. After all, many large-scale industrial processes rely on alternatives to fossil fuels such as oil and natural gas, e.g. steel manufacturing and bulk chemicals.

However, this hydrogen first needs to be produced in a climate-neutral way, subsequently transported to consumers and safely stored. This requires the development of a dedicated infrastructure, which is still in its early days in Germany. However, this process is gaining traction. As part of the National Hydrogen Strategy, the German federal government set itself the target of establishing 10 GW of electrolyser capacity by 2030. While this capacity currently (as of July 2024) only stands at approx. 150 MW, investors and operators have announced planned projects that amount to capacity of 13.4 GW by 2030 (see Figure 5). As such, Germany is leading the way in Europe. However, this will not even come close to meeting demand of at least 18 GW, with other estimates as high as 89 GW.

There is also the required transport and logistics infrastructure to consider. Pilot projects are under way in salt caverns. It is important to note that hydrogen, due to its low energy density, requires about four times as much volume as the same amount of energy in natural gas. Overall, there is a mammoth need for investment in hydrogen, but there seems to be no other option if Germany wishes to preserve its status as an industrial nation for raw materials.

Electrolysis capacities
Announced electrolysis projects by current status, planned/installed output and their (anticipated) first year of hydrogen production. Taken cumulatively, these output levels reflect the entire electrolysis capacity included in the H2 Compass.

Capacity in MWel



Source: ICE, Refinitiv Eikon, Darstellung Deutsche Emissionshandelsstelle (DEHSt), as of: 30 October 2023

See page 23 for an explanation of references

4 Repowering

Modernisation first.

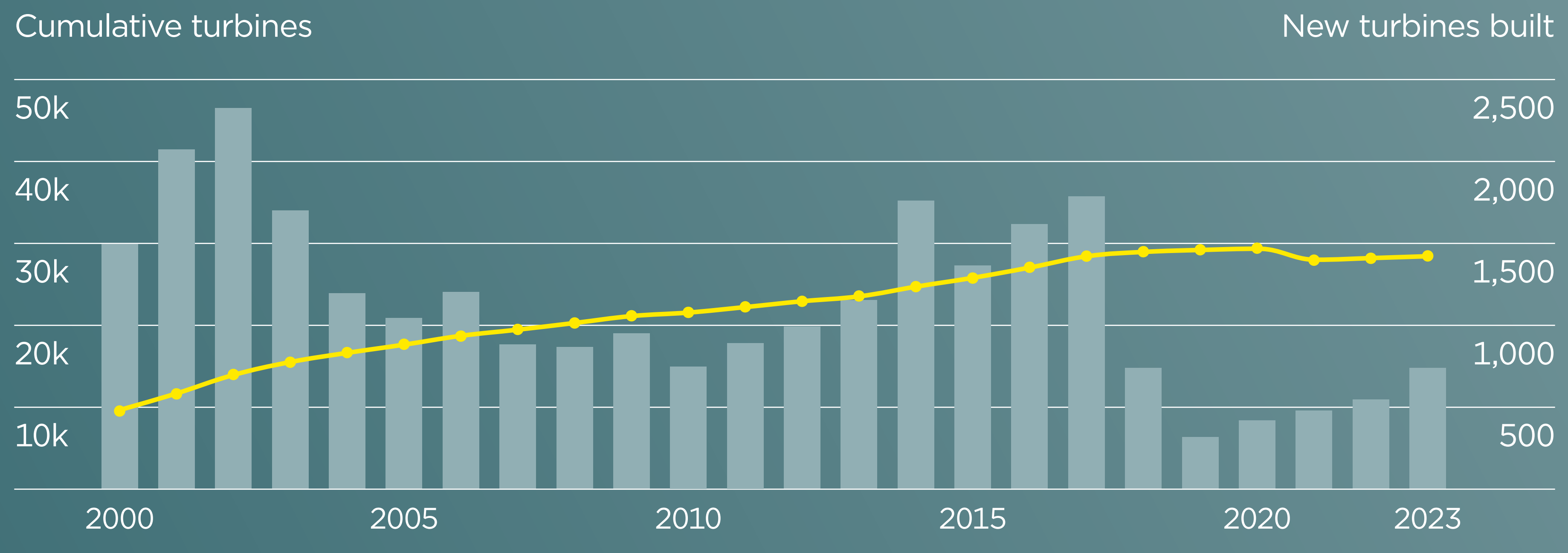
6 **15** **7**

Average equipment age and forecast end of life as per the technical life cycle in years

3x

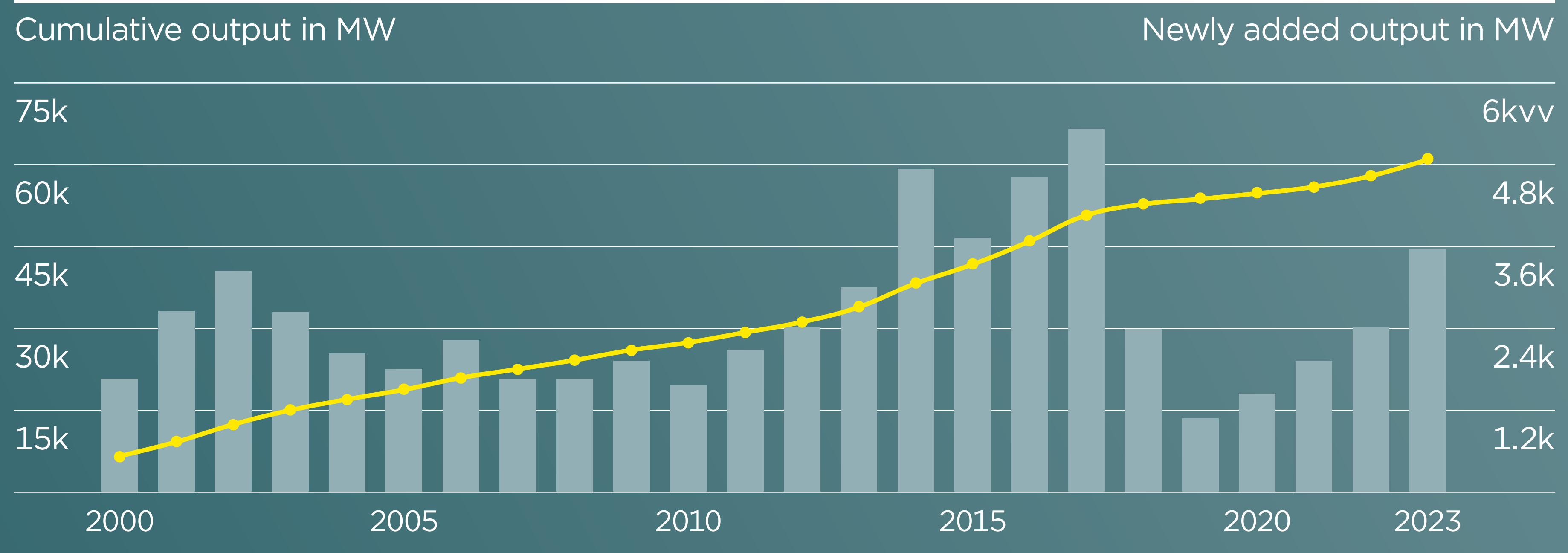
On average, newly installed onshore wind turbines are more than three times more powerful than their predecessors of twenty years ago.[13]

Wind turbines in Germany
Volume-weighted, not adjusted for inflation



Source: WindGuard GmbH, as of: 16 January 2024

Installed wind energy output in Germany



Source: WindGuard GmbH, as of: 16 January 2024

Replacements that make sense. And boost output.
Since the boom years in the 2000s and 2010s. the construction of new onshore wind turbines in Germany has tailed off considerably. The sharp fall from almost 1,800 new turbines in 2017 to 325 in 2019, the lowest level since the turn of the millennium, was chiefly due to changes in the German Renewable Energies Act (EEG). Since then, however, the pace has only slowly increased again, with 745 new turbines in 2023. There is another reason for the sluggish rate of expansion: wind turbines have generally already been built on the sites with the highest potential returns. In other cases, there is local opposition to perceived damage to the landscape.

These developments coincide with another: the boom in the industry prompted by the first EEE reached its 20th anniversary in 2020. This means that many wind turbines installed in the early 2000s with the help of subsidies are no longer covered by 20-year subsidies and are thus nearing the end of their life cycle. They are often located at extremely high-yield sites, where it would make sense to replace them with newer models, known as ‘repowering’. On average, newly installed onshore wind turbines boast an output of 4.8 MW, making them more than three times more powerful than their 1.4 MW predecessors of twenty years ago. This also explains why the level of newly installed output in 2023 is easily above that of the early 2000s and is back to the level seen in 2015.

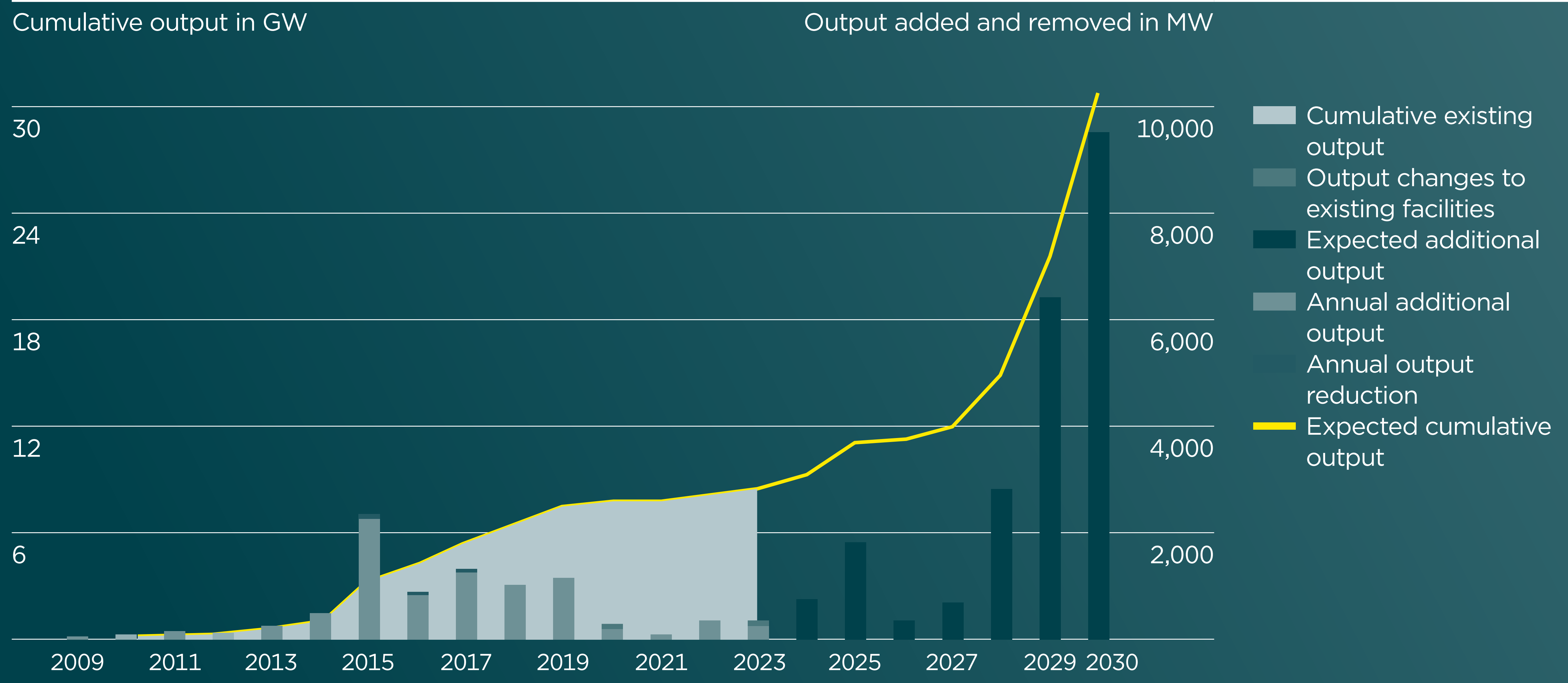
Whereas solar panels in Germany in 2023 represent the latest model, onshore wind turbines already constitute the oldest model five years before the forecast end of their twenty-year life cycle. It is expected that panels with an installed output of more than 54 GW – which is more than a third of the capacity installed in 2023 – will reach the end of their life cycle between 2034 and 2037. The majority of the output that will exceed its technical service life during this period stems from solar panels that were mainly installed between 2009 and 2012.

See page 23 for an explanation of references

5 Offshore wind

An energy boost from the coast.

(Expected) development of offshore wind energy output in Germany



Source: BWE, Ausbau der Offshore-Windenergie 2023: Die Projektrealisierung muss in den Fokus rücken!, January 2024

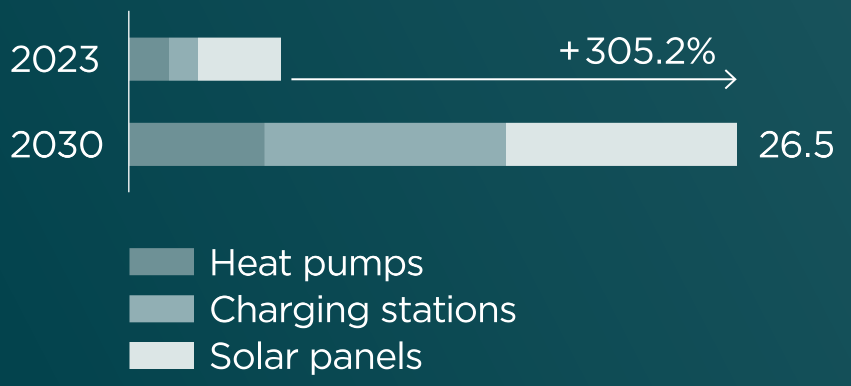
Huge potential on the high seas.
Despite all the repowering opportunities, additional capacities for building new onshore wind turbines in Germany are, for a variety of reasons, limited. This is one of the reasons, albeit not the only one, why offshore wind is increasingly growing in importance. The natural conditions are usually better. Here, the wind is generally more powerful, more frequent and more reliable than on land, enabling more stable electricity yields and higher outputs. What's more, the individual turbines are much larger and more powerful. By way of comparison: 27 new wind turbines went into operation in 2023 with an output of 9.5 MW per turbine, i.e. twice as high as on land. To enable the greatest possible efficiency in the use of the construction and grid infrastructure, these individual turbines are consolidated to form extremely large wind parks. Take the offshore wind park 'Veja Mate', for instance, which spans an area of roughly 50 km^2 in the North Sea, making it roughly the size of Lake Starnberg. The total output of the turbines installed here amounts to more than 400 MW.

Overall, the importance of offshore wind in Germany lags well behind onshore, but the potential for expansion and the potential output are far higher. According to estimates, the cumulative output could climb to 30 GW by 2030, which would roughly equate to the electrical output of 25 Biblis nuclear reactor blocks. To make this happen, however, a huge and highly specialised infrastructure is required alongside the turbines themselves; this ranges from manufacturing and transport of the rotors (up to 90 m long) and storage and loading capacities in the ports to special ships and platforms out at sea. The maintenance requirements are also correspondingly high. Therefore, there is not only a need for investment in the offshore wind parks themselves; their associated infrastructure also represents a bottleneck and requires further expansion, although it already constitutes a not insignificant economic factor and employer in the regions concerned.

6 Energy grids

Electricity, gas and heating.

Number of additional grid users (in millions)



+305.2%

Source: EY Germany

Network(s) for a healthy climate.
Alongside the generation of electricity from sustainable resources, the expansion of electricity, gas and district heating grids is a critical factor in low-emission energy supply.

Increasing consumption, coupled with new purchasing profiles, results in greater demands and considerable need for investment, with the roll-out of intelligent metering systems still in its infancy. High supply security, however, remains assured at all times. In an overarching sense, there is a need to intensify sector coupling between electricity, gas and hydrogen.

To make this a reality, planning and approval processes must be accelerated, and an economic framework created for investments. This transformation requires close cooperation between all parties involved. In addition to grid expansion, there is also a need for more digitalisation, standardisation and automation.

Two types of grid operator and annual investments needed in the electricity grid (billions of euros)

TNOs
Transmission system operators

operate the national power grid and transport electricity over large distances at high voltage. They are responsible for the expansion of the power grid, managing electricity flows and for operation.

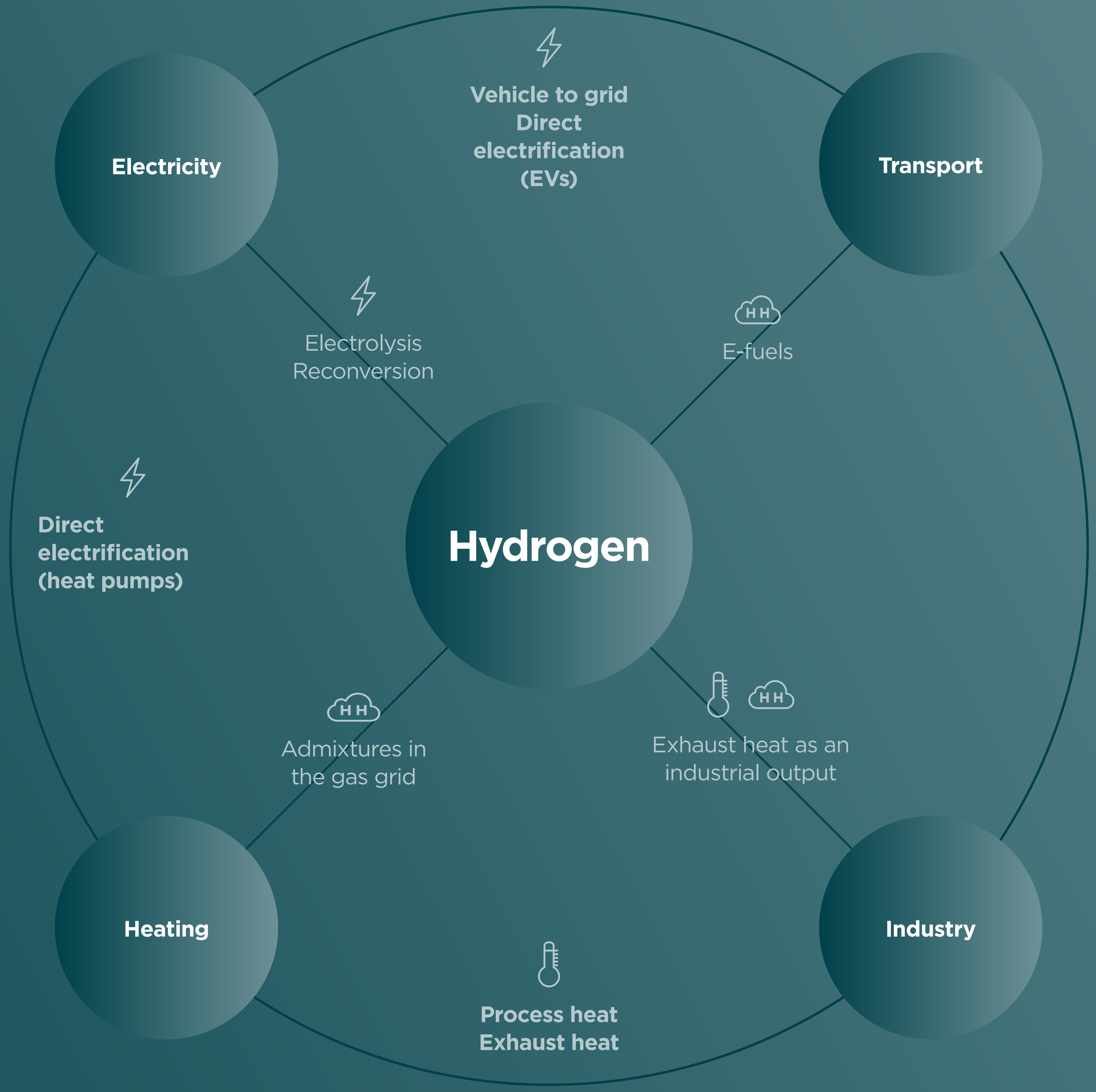
DSOs
Distribution system operators

ensure that electricity providers and consumers are connected to the grid at a regional level. At regional level, they administer the distribution infrastructure, including substations and transformers.

Source: EY Germany

7 Sector coupling

All together now.



Interconnected energy.
Sector coupling describes the process of connecting electricity, heating and gas grids, as well as the transport sector as a key technology, in order to holistically decarbonise and thus achieve carbon neutrality. In Germany, one challenge lies in the current focus on the electricity transition as the basis for the energy transition, Due to the increasing use of renewable energies, however, the positive and negative residual load is also rising, leading to insufficient/excess coverage of electricity needs during load periods.

Moreover, problems within the sectors are generally considered in isolation and there is no holistic solution in terms of how sector advantages can be harnessed to solve problems. Sector coupling aims to bring about improvement in this regard, with green hydrogen having the potential to act as a key technology for the speedy implementation of sector coupling. 'Power-to-X' solutions represent a current driver in this area, with renewable energies as the starting point.

Power to X

Gas

By means of electrolysis, hydrogen can be produced as surplus green energy; it can then be distributed via the existing gas infrastructure as natural gas following subsequent methanisation.

Heat

Surplus electricity can be converted into heat (heat pumps). Surplus heat can also be used as district heating.

Valuable

Surplus energy for industry, e.g. melting metals.

Mobility

Surplus electricity is temporarily stored in car batteries and then released into the grid when not enough energy is available.

Liquids

In the form of excess manufacturing of synthetic hydrocarbons (kerosene, etc.).

Conclusion and outlook

Some of the seven potential solutions are still a long way off, whereas others are already gaining ground.

The expansion of offshore wind energy and repowering are already picking up noticeable momentum, even though major investments are still needed in the offshore segment and no suitable approach to repowering has yet prevailed. Battery storage systems will soon emerge and expand away from their previous niche in the next two to three years, allowing the production and availability of wind and solar power to be further improved.

It will be imperative to expand and optimise the grid infrastructure for transporting electricity, gas and heating in the years ahead in order to ensure blanket energy coverage. It remains to be seen whether facility hybridisation will become a mass phenomenon by the end of this decade; in tandem with battery storage systems, however, it should at least be widespread by 2030. The pace at which power grids are expanded, modernised and digitalised needs to be accelerated at all levels if the targets set are to be achieved.

There is more uncertainty when it comes to the development of hydrogen, as some unknowns still apply and certain technical challenges still need to be overcome. First and foremost: where will electrolysis be carried out and using what energy? And how will the hydrogen reach the consumer? The current political standpoint on electric vehicles also makes it harder to continue developing hydrogen as an alternative fuel in road traffic. Solving these challenges, however, enables holistic sector coupling that could unlock further potential and enable further steps towards achieving the climate targets set.

Overall, the aforementioned developments are set to shape the continuation of the German and European energy transition in the second half of this decade. Therefore, investors should keep an eye on them in the years ahead.

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Infrastructure is king. Networking is key.

Henning Koch
Chief Executive Officer,
Commerz Real AG

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To ensure sustainable growth, we need to design our infrastructure with intelligence and foresight. The rapid global changes require us to think and cooperate at an overarching level. Here, both private and institutional investors are indispensable in order to successfully spearhead the transformation. Innovative technologies and close partnerships will lay the foundation upon which we will develop an efficiently interconnected infrastructure that is equal to the demands of tomorrow.

The question is no longer property and energy – anyone serious about genuine sustainability and avoiding CO_2 has no alternative to taking an integrated approach to property and energy. We are already in the thick of things and look forward to taking further huge strides in partnership with you.'

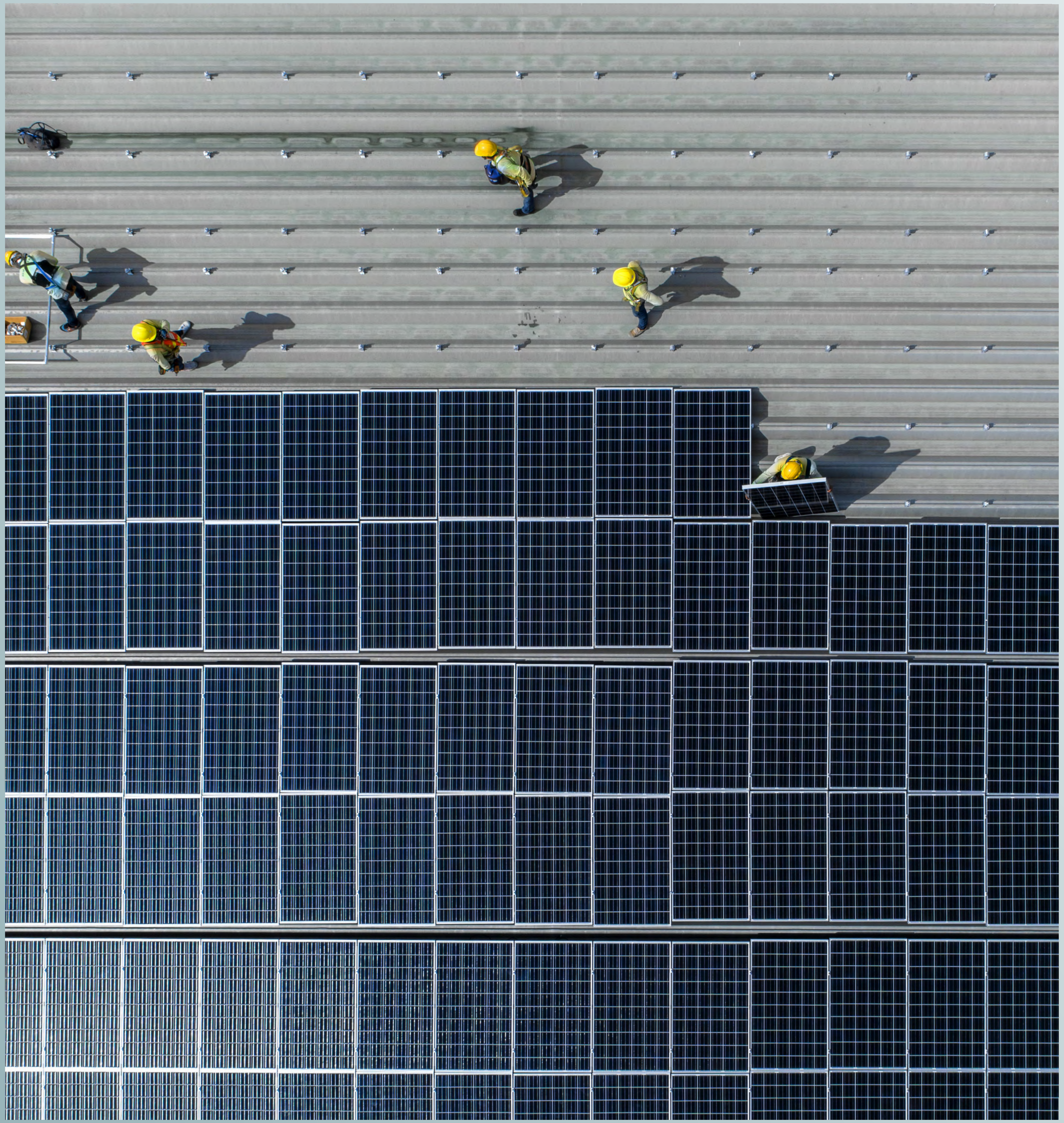
Glossary

Power purchase agreements (PPAs)
are long-term contractual agreements between electricity producers (e.g. operators of renewable energy facilities) and purchasers (e.g. energy providers or other companies). A PPA stipulates that the producer will supply the purchaser with a specified quantity of electricity at a set price and over a set period. PPAs play a central role in the renewable energies sector, as they offer investment security in connection with the development and operation of energy projects. PPAs serve as an instrument for promoting the energy transition by mitigating the risk of market price volatility, creating a stable income stream for producers and enabling companies to meet their sustainability targets by procuring green electricity. In liberalised electricity markets and regions without subsidy models, PPAs are especially pivotal when it comes to financing new wind and solar power projects.

Primary energy demand
Primary energy demand describes the total amount of energy needed to cover energy demand, including energy lost during extraction, conversion and transport. It comprises the energy gained from natural resources such as fossil fuels, renewable energies and nuclear power and represents a key indicator of the energy efficiency of buildings, plants and processes. Primary energy demand can be effectively lowered through energy-efficient technologies, the use of renewable energies, optimised processes, combined heat and power (CHP), sustainable behaviours and improved building insulation.

Residual load
(lat. residuum: 'rest') is the required electrical output less the feeding in of volatile energy sources, such as wind turbines and solar panels.

Resource efficiency
describes the reduction of consumption and resource wastage through the use of efficient and environmentally friendly technologies and processes. Although closely linked to energy efficiency, it nonetheless constitutes a separate concept. In particular, resource efficiency focuses on dematerialisation, i.e. the reduction of material usage while still maintaining the quality of products and services, and circularity. The latter seeks to achieve closed material cycles, e.g. by means of design strategies and the recycling, reuse, repair, regeneration, repurposing and reprocessing of materials.



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About us

WHAT SPURS US ON

We create connected and sustainable life spaces that inspire. Success through responsibility.

Commerz Real
Commerz Real is the Commerzbank Group's asset manager for investments in tangible assets and has over 50 years of international market experience. More than 800 employees manage assets of around 34 billion euros at the headquarters in Wiesbaden and 17 other sites and subsidiaries in Germany and abroad. Commerz Real combines comprehensive asset management know-how and broad structuring expertise to create its characteristic range of tangible asset-oriented fund products and individual financing solutions. Our portfolio also includes entrepreneurial investments with investments in tangible assets in the key segments of real estate and renewable energies. In its role as the leasing service provider of the Commerzbank Group, Commerz Real also offers tailored equipment leasing concepts.

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