



# Sustainability Report 2024

**MAN Energy Solutions**  
Future in the making



**Building a  
sustainable  
future**

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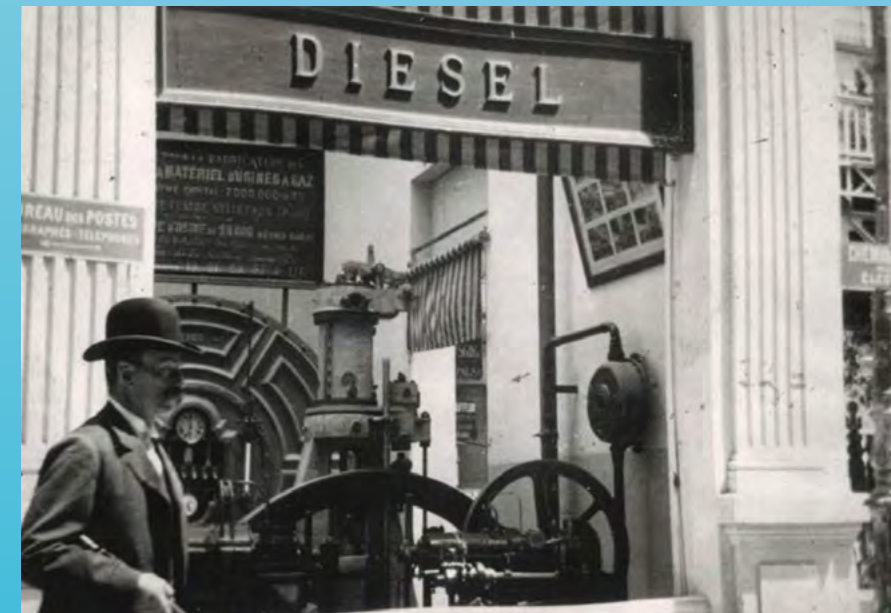
# This is MAN Energy Solutions

**M**AN Energy Solutions is headquartered in Germany and employs around 16.200 people worldwide. In addition to a total of twelve production sites, there are more than 130 locations in the global service center network of our after-sales brand MAN PrimeServ.

Our technology portfolio includes two- and four-stroke engines for maritime and stationary use, turbochargers and propellers, as well as gas and steam turbines, compressors and chemical reactors. We are the world's leading supplier of large diesel and gas engines. Our efforts to meet emissions standards while reducing fossil fuel consumption worldwide are making an important contribution to preserving our world for future generations.

Our aim is to develop solutions for profound decarbonization in the most important sectors of the global economy, such as maritime shipping and what are known as »hard-to-abate« sectors. These are the industries that are very difficult to decarbonize. This is intended to pave the way to a climate-friendly global economy. We work and think digitally, and we offer innovative digital solutions that help our customers reduce their greenhouse gas emissions and achieve the »net zero« goal. The focus is on five kinds of technology: large engines powered by future fuel, retrofits, industrial heat pumps, Carbon Capture Utilization and Storage (CCUS) and PEM electrolyzers from our subsidiary Quest One.

**T**he history of MAN Energy Solutions dates back more than 260 years. These more than two and a half centuries have mainly been characterized by the company's readiness and ability to adapt its product range to market changes in good time. Frying pans and cannonballs were followed by printing presses and steam engines, and finally diesel engines and turbomachines. The invention of the diesel engine represents the most important and well-known milestone in MAN history to date — a world-changing invention that would not have been possible without the vision of individual people like Heinrich von Buz. MAN Energy Solutions is still showing this vision today: The »Moving big things to zero« strategy focuses on solutions for decarbonizing the global economy and outlines the company's transformation from a pure product supplier to a provider of complex new solutions in shipping, energy generation and industry.



The first diesel engine, presented at the 1900 World's Fair in Paris  
Photo: MAN Energy Solutions historical archive

## Dear readers,

**S**ustainability is not just an obligation — it is an opportunity: An opportunity to design our technologies in such a way that they make a measurable contribution to combating climate change. An opportunity to minimize our consumption of resources and drive forward the circular economy. And an opportunity to offer our employees and partners a responsible, future-proof environment.

This conviction is at the heart of our sustainability strategy, which was further developed in 2024. We have examined the impact of our actions on the environment and society as well as the impact of sustainability on our corporate success and have refined and clearly defined our strategic priorities in the area of sustainability: The three dimensions of decarbonization, nature and people & society guide our actions and reflect our responsibility as a company.

**Decarbonization is our business:** Climate change is the greatest challenge of our time — and at the same time a driver of innovation for our company. Our aim is to play an active role in shaping the transformation of energy-intensive industries. We do this through technologies that significantly reduce carbon emissions and enable the use of climate-neutral energy sources.

We develop solutions for the maritime sector that enable operation with alternative fuels such as ammonia and methanol. In the energy industry, we are focusing on hydrogen technologies and power-to-X processes, which play a key role in the decarbonization of industry. By 2030, there will be a more climate-friendly version in our portfolio for every major application in new constructions — a clear sign of our commitment to an emission-free future.

**Our commitment to nature:** We take responsibility for the preservation of our natural environment. We have therefore set ourselves the goal of halving our carbon emissions in production by 2030 compared to 2018.

This change begins in our own plants: We are investing in modern, energy-efficient production processes, expanding our in-house generation of renewable energy, and focusing on a consistent reduction in waste and raw material consumption. We also consider our technologies' environmental impact throughout the entire product lifecycle and maximize their useful life with durable, recyclable components.

Another key issue is the protection of biodiversity. We analyze the impact of our products and sites on ecosystems and develop measures to counteract negative influences — be it through noise reduction in the maritime sector or through environmentally friendly production processes.

**Responsibility for people & society:** Our corporate success is inextricably linked to our responsibility for our employees and partners. Therefore we are committed to the highest standards of occupational health and safety. We take responsibility for environmental and social standards in our supply chains. We demand sustainable business practices from our suppliers and ensure that human rights and working conditions are respected.

Sustainability is as much an opportunity as a duty for us — and a path that we are consistently pursuing.



# Moving big things to zero

On the following pages, you can read about where we are today and what we have actually achieved on this path in 2024.

I would be delighted if you would continue to accompany us on our sustainability journey in the future.



*U. Lauber*

**Dr. Uwe Lauber**

Chief Executive Officer  
MAN Energy Solutions SE



# Our sustainability strategy

The global energy transition requires a far-reaching transformation of the maritime industry, the energy sector and the manufacturing industry. Rising carbon pricing, stricter regulations and growing expectations from customers, investors and society highlight the need to act quickly. As a technology company, we play a central role in this urgently needed transition to a climate-neutral economy: Our products and systems are essential building blocks for the decarbonization of industrial processes. This gives us the opportunity to make a measurable contribution to achieving global sustainability goals through innovative solutions.

## Sustainability as the core of our corporate strategy

The sustainability strategy, which was revised in 2024, is an integral part of our corporate strategy »Moving big things to zero« and thus makes a significant contribution to our long-term competitiveness.

It is based on a comprehensive analysis of our value chain as well as exchanges with stakeholders, managers and experts. We specifically identified areas in which our

impact on the environment and society is greatest and which therefore have a formative influence on our entrepreneurial activities.

Our strategy rests on three pillars and is based on the UN Global Compact, which was signed by our parent company Volkswagen. This comprises ten principles on human rights, work ethics, environmental protection and anti-corruption as well as the 17 Sustainable Development Goals (SDGs). Our sustainability strategy is designed to make a targeted contribution to these global goals. To this end, we consistently integrate sustainability aspects into all business processes.



**Dimension 1**

## Decarbonization is our business

Our technologies are crucial for the decarbonization of energy-intensive industries. In the maritime sector, our dual-fuel engines enable the use of climate-neutral fuels such as ammonia and methanol. In addition, our power-to-X technologies promote the production of synthetic fuels.

In energy generation, we are also focusing on expanding the hydrogen economy and offer solutions along the entire value chain — from electrolysis to hydrogen compression. We develop targeted CO<sub>2</sub> reduction solutions for energy-intensive industries, including heat pumps and carbon capture, utilization and storage (CCUS). Sustainability criteria are already firmly anchored in the product development process to ensure maximum efficiency and minimum climate and environmental impact. Digital solutions also optimize the operational performance of our technologies.

**Dimension 2**

## Nature

We will halve CO<sub>2</sub> emissions at our production sites by 2030 compared to 2018. We are achieving this through a comprehensive modernization program, the expansion of our own photovoltaic generation, and the complete switch to purchased green electricity.

However, our understanding of sustainability goes beyond CO<sub>2</sub> reduction: We are optimizing our use of resources in production, improving our waste and recycling management, and focusing on durable, easy-to-maintain products. Our MAN PrimeServ after-sales service helps customers maximize the operating life of their systems while minimizing pollution.

We systematically integrate the protection of biodiversity into our environmental management. We analyze biodiversity risks at our sites and implement measures for ecological enhancement. We also consider the impact of our products on nature during their operation.

**Dimension 3**

## People & Society














As an employer, we focus on the systematic development of our employees. Continuous learning is supported by targeted programs that address technical and interdisciplinary skills in equal measure. We promote diversity and equal treatment. Flexible working environments are making it increasingly possible for employees to maintain a balance between operational requirements and individual needs.

We ensure health and safety in the workplace through systematic management. »Vision Zero«, i.e. company operations with no accidents at work, is our guiding principle for continuous improvement.

We are gradually implementing higher sustainability standards in the supply chain. Suppliers are selected and evaluated on the basis of defined criteria that are regularly reviewed. A comprehensive due diligence system in accordance with Germany's Supply Chain Act ensures compliance with human rights.

Our social commitment focuses on promoting education and social projects at our sites. We combine local initiatives with overarching programs. We invest in young talent in technical professions through strategic partnerships with educational institutions.

## Moving big things to **zero**

Dimensions	Sustainability topics	What we aim for	Sustainable development goals
 <p>Decarbonization is our Business</p>	<ul style="list-style-type: none"> <li>- Sustainable Business</li> <li>- Decarbonization through our products</li> </ul>	<p>Our technologies aim to facilitate the transition of our clients to the target of net-zero emissions.</p>	 
 <p>Nature</p>	<ul style="list-style-type: none"> <li>- Emissions production and supply chain</li> <li>- Resources &amp; Circularity</li> <li>- Biodiversity</li> </ul>	<p>We aim to achieve net-zero emissions in our own operations, decarbonize our supply chain and drive the shift to a circular economy.</p>	    
 <p>People &amp; Society</p>	<ul style="list-style-type: none"> <li>- Diversity</li> <li>- Training &amp; People Development</li> <li>- Health &amp; Safety</li> <li>- Responsibility &amp; Human Rights in the Supply Chain</li> <li>- Corporate Citizenship</li> </ul>	<p>We strive to be a preferred employer that fosters diversity, equity and inclusion and ensures health and safety of the workforce.</p> <p>We are committed to responsibility in the supply chain and want to have a positive impact on society.</p>	  



# Our sustainability organization

**S**ustainability is a central corporate responsibility at MAN Energy Solutions and is anchored directly in the Executive Board. The newly structured and enlarged central sustainability department is responsible for controlling and coordinating sustainability management. It develops and manages the sustainability strategy, assesses ESG risks and opportunities, and is in close contact with various stakeholder groups.

A particular focus of the work is on the company-wide decarbonization strategy. This includes recording and reducing Scope 3 emissions along the entire value chain and quantifying the emissions avoided or reduced by our products. A standardized and transparent methodology for calculating these emissions is currently being developed in order to make the company's contribution to global emissions reduction measurable.

The department is also responsible for regulatory sustainability reporting and its presence in ratings and on sustainability platforms.

In addition to the central function of the sustainability team, there are sustainability managers in individual business areas and specialist departments who are responsible for specific or local sustainability issues. In addition, themed

working groups are dedicated to specific sustainability projects, such as biodiversity management, increasing energy efficiency or reducing CO<sub>2</sub> emissions.

A key steering body is the Sustainability Council, which consists of representatives from the business areas and group functions and meets every two months. Chaired by the Chief Operating Officer, it defines strategic sustainability goals, determines the focus of measures, and serves as a knowledge transfer platform within the company.



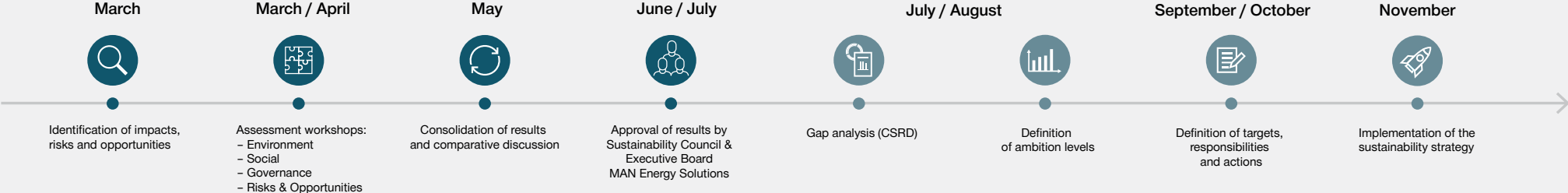
**Further information and the most important documents relating to our sustainability management and our sustainability organization can be found [here](#):**

- Code of Conduct
- Code of Conduct for suppliers and business partners
- Anti-Slavery and Human Trafficking Statement
- VW Social Charter MAN Energy Solutions
- MAN Energy Solutions mission statement

# The double materiality assessment

Although we are not obliged to do so as a Volkswagen subsidiary under the European Corporate Sustainability Reporting Directive (CSRD), we have carried out a double materiality assessment as part of the development of our new sustainability strategy. This took place from March to June 2024. The illustration below shows the process steps involved.

The aim was to gain a holistic perspective that comprehensively takes into account both the business impact and the consequences for the environment and society (double materiality principle; inside-out and outside-in view).



Procedure of the double materiality assessment



**ESRS category Pollution:** Conventionally powered engines have a negative impact on local air quality, especially in port areas. In the long term, however, we see great potential for reducing air pollution through the use of future fuels such as ammonia.

**ESRS category Biodiversity:** Underwater noise from engines and propellers, which can have a negative impact on marine life, was identified as a key aspect here. This is an important issue that we need to address.

**ESRS category Circular Economy:** Some of our production materials come from non-renewable sources. The shipping and energy business in particular is resource-intensive. However, our foundry activities mainly use secondary iron and steel materials. Our product design and services have a positive effect, enabling a long product service life. Added to this is the high recyclability of the materials contained, such as steel and iron. We are continuously working on making our products and processes more sustainable and thus making a positive contribution to environmental protection.

## Environment:

### European Sustainability Reporting Standards (ESRS) category

**Climate Change:** The use of fossil fuels in the maritime and industrial sectors causes relevant greenhouse gas emissions at a global level. We are therefore developing technologies and solutions for decarbonization in industries that are difficult to transform, such as shipping. These include technologies such as carbon capture, utilization and storage (CCUS), heat pumps, hydrogen, and innovative retrofit solutions. In the long term, these developments have the potential to make a positive contribution to reducing greenhouse gas emissions. From a financial perspective, our corporate strategy with its focus on decarbonization technologies also opens up significant market opportunities.

As regards the energy aspect, while large engines are still often powered by fossil fuels, our growth areas are focusing on the transition to alternative energy sources such as future fuels. This transition from fossil fuels to renewable energies represents a significant financial opportunity for our company.



**Social:**

**ESRS category Own Workforce:** We offer our employees and contractors safe and healthy working conditions at our sites. This is reflected in our safety culture and our accident prevention measures. We also promote equal opportunities and diversity in management positions and the workforce as a whole. We strive to create an inclusive corporate culture, avoid discrimination and take appropriate account of the interests of our workforce.

**ESRS category Workers in the Value Chain:** We require our suppliers to take responsibility for the occupational health and safety of their employees and thus ensure that human rights and basic labor standards are also observed by our business partners.

**ESRS category Consumers and End Users:** Should defects or safety incidents occur in our products, these could have serious consequences for our customers and end users. We take this issue very seriously and have introduced comprehensive processes to ensure product safety and quality.



**Governance:**

**ESRS category Business Conduct:** Overall, our governance approach shows that we see corporate responsibility as an integral part of our corporate culture.

Our strengthening of integrity and ethical behavior is central here. Through clear behavioral guidelines, regular employee training and transparent corporate governance, we help to build trust with our stakeholders. We also combat corruption and bribery by implementing appropriate guidelines and consistently monitoring compliance with them.

A whistleblower system enables our employees to report cases of unethical behavior anonymously. This enables us to identify compliance violations at an early stage and prevent negative effects on the environment and society.

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The results tables of the double materiality assessment can be found in the chapter [»Key figures and additional information.«](#)



# Our 2024 highlights

Our approach to sustainability is holistic: We combine climate protection, social responsibility and economic innovation across all areas of the company to create an integrative understanding of sustainability and put this into practice through an array of different measures.

In 2024, we recorded numerous small and large successes across the range of areas in which we are taking action. These serve as confirmation of our progress and make our sustainability strategy tangible.



## Mega heat pump in Esbjerg supplies the first climate-neutral heat

In November 2024, MAN Energy Solutions successfully commissioned the first of two large heat pump units in Esbjerg (Denmark), providing initial heat for the city. This is the world's largest CO<sub>2</sub>-based seawater heat pump. The plant, which is operated by DIN Forsyning and has a total output of 70 MW, provides around 280,000 MWh of climate-friendly heat per year and supplies 25,000 households in Esbjerg and Varde. Together with other plants, it replaces a coal-fired power station and thus reduces CO<sub>2</sub> emissions by 120,000 tons per year.

The innovative technology uses renewable energy from nearby wind farms and seawater as a heat source. How CO<sub>2</sub> is used as an environmentally-friendly refrigerant in a closed circuit is particularly worthy of note, and represents an important aspect for operations in the immediate vicinity of

the delicate Wadden Sea UNESCO World Heritage Site.

The heat pump is highly efficient: For every megawatt hour of electrical energy used, three megawatt hours of usable heat are generated. The plant is also able to flexibly react to fluctuations in the electricity grid, thus helping to stabilize energy supply. It is supplemented by a 60 MW wood chip boiler and a 40 MW electric boiler system for peak loads.

The commissioning of the large heat pump unit marks an important step on the city of Esbjerg's path to climate neutrality by 2030, and shows how innovative technology can drive the transformation of the energy infrastructure forwards. It also sets new standards for sustainable urban energy systems.



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### Quest One opens new gigahub for sustainable hydrogen production in Hamburg

Quest One is pursuing the ambitious goal of preventing one percent of global greenhouse gas emissions by 2050 through its electrolyzers. Thanks to its new gigahub in Hamburg-Rahlstedt, MAN Energy Solutions has taken a decisive step towards this goal.

The grand opening on September 30, 2024 was attended by 800 guests, including Federal Chancellor Olaf Scholz and Hamburg's First Mayor Dr. Peter Tschentscher. The new development and production facility was built in just one and a half years on an area of 26,000 square meters and enables automated series production for PEM stacks, the central components in electrolyzers. Thanks to state-of-the-art automation, the production time of a stack can be reduced by 75 percent, and a unit is now produced in less than an hour. With a total annual electrolysis capacity of over five gigawatts, the gigahub makes a decisive contribution to scaling up hydrogen production.

The new site, which also functions as a customer and training center, is not only ultra-modern, but also designed to be sustainable: Green roofs with photovoltaic systems and the DGNB platinum certification we're striving for underline our commitment to environmentally-friendly production.



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### COP29 in Baku: keeping our finger on the pulse of climate change mitigation discussions

COP29 (Conference of the Parties 29) was the 29th UN Climate Change Conference, and took place in Baku (Azerbaijan) in 2024. It was part of the United Nations Framework Convention on Climate Change (UNFCCC) and brought together representatives from almost 200 countries. Dr. Uwe Lauber, CEO of MAN Energy Solutions, took part in the conference and saw first-hand the intensive discussions that took place about the decarbonization of industry and the role technological innovations play in mitigating climate change.

#### **The Blue Zone: the hub of the climate debate**

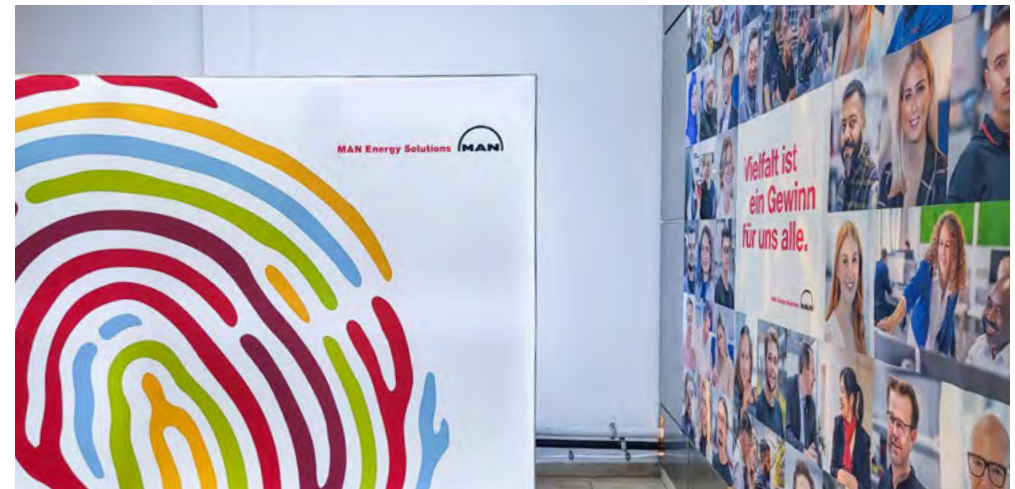
Representatives from politics, science, business and environmental organizations met in the Blue Zone at the conference. Discussion topics ranged from the maritime energy transition and expansion of green hydrogen markets to the transformation of national economies. Dr. Lauber presented MAN Energy Solutions technology and solutions, especially for sectors that are difficult to decarbonize, such as shipping, where hydrogen-based alternative fuels play a key role on the journey to climate neutrality. Dr. Lauber also took part in technical discussions in the German pavilion and presented best-practice solutions for reducing CO<sub>2</sub> emissions.



### **BGM program »Frauengesundheit er#leben« (Experiencing women's health) honored with Human Resources Excellence Award 2024**

Frauengesundheit er#leben, an innovative offer specifically for our female workforce, was recognized as the winner of the Wellbeing & BGM category at the HR Excellence Awards (HREA) 2024. The HREA are considered the most important award in the field of human resources in the DACH region and are handed out by Quadriga Media GmbH and the specialist magazine Human Resources Manager for 33 categories every year. Its aim is to recognize outstanding projects, ideas and campaigns and bring them to the public's attention.

Our award-winning Frauengesundheit er#leben campaign, which we've implemented together with the BARMER health insurance company, offers our female employees an opportunity to strengthen their individual health literacy: The program enables them to address their motives surrounding health and personal well-being, and teaches them the skills to have an active impact on their own health. You can read more about this on [page 68](#).



### **Diversity Day 2024: MAN Energy Solutions celebrates diversity**

For German Diversity Day on May 28, 2024, MAN Energy Solutions celebrated diversity within the company and showed their support for diversity and inclusion with the array of activities on offer.

Various initiatives took place at the MAN Energy Solutions sites in Augsburg, Berlin, Deggendorf, Hamburg and Oberhausen: In Augsburg and Berlin, for example, the canteen areas were transformed into meeting places to provide information about diversity at MAN Energy Solutions. In Oberhausen and Hamburg, employees greeted their colleagues with personal greeting cards as they arrived at work in the morning.

Denmark sent out a strong message in 2024, with the signing of the Danish Diversity Charter by the local diversity team being a particular highlight - a step that gained recognition beyond the country's borders. It underlines MAN Energy Solutions' long-term commitment to an inclusive and open workplace.

### **Diversity as a success factor for MAN Energy Solutions**

With a company history spanning over 260 years and around 130 locations worldwide, diversity is an integral part of MAN Energy Solutions' corporate culture. We are convinced that diversity, innovation and competitiveness go hand in hand. We therefore attach great importance to fostering a culture of fairness and inclusion, where all employees are valued and supported regardless of age, gender, cultural background, lifestyle, physical or mental abilities and sexual orientation.

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### Intranet #CU.LIVE wins silver at the Intranet & Digital Workplace Awards

In August 2024, our intranet #CU.LIVE won silver at the Intranet & Digital Workplace Awards. The awards have been presented since 2018 in the categories Media, Strategy, Campaign, Intranet & Digital Workspace, and International Internal Communication and are one of the biggest prizes for internal communication in Germany.

The jury especially praised our systematic governance approach, which encompasses both the centralized and decentralized creation of content, and the innovative design processes that go beyond technical optimization.

The award also corroborates the efforts we've made to digitally transform and modernize the workplace: Our aim is to promote an efficient, networked and sustainable working culture with intranet tools such as the newly designed Employee Hub, where employees can find all the tools relating to their day-to-day work (e.g. time and attendance logs, HR forms, etc.) and better collaboration areas. In this way, we also want to optimize our work processes overall, strengthen employee engagement and increase ecological and economic efficiency.



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### Team Awards 2024: recognition for outstanding international projects

The MAN Energy Solutions internal Team Awards 2024 recognize exceptional projects and underline the importance of international cooperation and technological innovation for a sustainable future. In 2024, the decision between gold, silver and bronze was particularly close. All three winners impressed with their innovative technology and forward-looking solutions in the areas of AI, CO<sub>2</sub> reduction and digital networking.

#### Gold for the MAN Energy Solutions CEON chatbot

The MAN Energy Solutions CEON Chatbot AI project, led by Gregory Puckett, secured first place. An international team from Germany, Denmark and India spent over a year developing an AI-supported knowledge database that offers our customers unique support by providing access to over 1.5 million product documents. The solution can search and analyze around 500,000 pages and 20 TB of data. The chatbot offers 24/7 customer support, real-time analysis of product performance and fault diagnosis, as well as secure management for confidential information. This reduces support requests, minimizes downtime and optimizes maintenance processes, and all of this contributes significantly to resource efficiency.

#### Silver for the Tangguh UCC CCS project

The silver award went to the Tangguh UCC project, led by Dr. Marco Ernst. The team from the UK, Germany and Indonesia is implementing the first carbon capture and storage (CCS) project in the Asia-Pacific region. In cooperation with BP, a flagship CCS plant will be built in Indonesia to offset 25 percent of the company's global emissions. The compressor technology used is based on our many years of experience with CO<sub>2</sub> compression and offers efficient, reliable solutions for large-scale projects aimed at mitigating climate change.

#### Bronze for Testbench 2020

The Testbench 2020 project, led by Dr. Matthias Auer, was given the Bronze Award. A team from Denmark, Germany, France and India has developed a global, cloud-based platform for creating a network of engine test benches. This innovative creation enables efficient data exchange, synchronized configurations and standardized test reports, preventing data silos and significantly improving transparency. The data are more readily accessible and can be used both for troubleshooting and for future development projects.



# Decarbonization is our business

## Our motivation

We are convinced that innovative technology is the key to a climate-neutral future and see it as our responsibility to actively shape this change.

## Our ambition

Our technology aims to enable our customers to transition and achieve the »net-zero emissions« goal.

## Our goals

By 2030, there will be a more climate-friendly version of every main application in new construction in our portfolio.

Our decarbonization solutions will account for at least half of our revenue by 2030.

**Revenue share for decarbonization solutions:  
≥ 50 percent | 2030**

## Alignment and strategy

**At MAN Energy Solutions, we strive to do pioneering work when it comes to developing solutions for the world's largest industries – and thus to contribute to change for the better. With these aspirations, we are rising to the biggest challenge of our time: climate change.**

**D**eveloping solutions for decarbonization for key sectors of the global economy is not only our mission, but also our business model: We want to lead the way in our business areas as pioneers of global decarbonization and pave the road to a climate-neutral future with our products – in the maritime sector, energy industry and in industrial applications too. We are committed to providing new technology and solutions to decarbonize the economy, and we strive to avoid, reduce and neutralize CO<sub>2</sub> emissions wherever possible. We want to be a reliable partner for our customers and support them in their sustainability efforts through our products and solutions, so that we can all achieve our overarching goal of »net zero« together. All of this sums up our vision: »Moving big things to zero.«

In concrete terms, this means that by 2030, sustainable technology and solutions will make up the majority of our business. In addition, our portfolio will include at least

one technological solution for each of our main applications, for more climate-friendly product operation.

By 2030, we want to offer products for the maritime industry and energy generation that pave the way to decarbonization. We are working to enable our customers to use a variety of alternative fuels, known as future fuels, which are produced synthetically and, following a »well-to-wake« assessment, only cause very low greenhouse gas emissions or none at all. Many of our gas and dual-fuel engines can already be powered by future fuels such as synthetic natural gas (SNG). Fuels such as ammonia or »green« methanol are set to play an important role in the future, and so we are intensively researching and developing in this area.

At present, these »future fuels« are not yet available on the market in sufficient quantities. For this reason, we are also working on appropriate solutions to produce these fuels

so that we can use them in our engines. In addition to our product-related decarbonization efforts, we are also committed to implementing regulatory and market-related framework conditions, e.g. through our membership in the National Hydrogen Council of the German Federal Ministry of Economic Affairs and Energy. This way, we support the goal of making the necessary fuels available to the market at competitive prices in the future.

As part of our »Moving big things to zero« strategy, we are focusing on five business areas and types of key technology that not only offer enormous potential for decarbonization, but also for our corporate success:

**Decarbonization through climate-friendly engines:** Our more environmentally friendly engines can be powered by future fuels such as green hydrogen, ammonia, methanol and biofuels, and make a significant contribution to reducing emissions from maritime shipping and plants.

**Decarbonization through retrofit solutions:** We retrofit existing ships and plants to reduce fuel consumption and emissions. This also significantly extends their lifespan and thus saves the resources that would be required for building new.

**Decarbonization through green hydrogen:**

Hydrogen is a key element of decarbonization and essential for the production of various synthetic fuels such as green methane, methanol or ammonia through power-to-X processes.

**Decarbonization through heat pumps:**

Heat pumps are a powerful solution for decarbonizing heat generation. Our high-temperature industrial heat pumps for district heating and the process industry provide sustainable heat and thus contribute to the energy revolution.

**Decarbonization through CCUS (Carbon Capture Utilization and Storage):**

Decarbonization is especially achieved in the industrial sector through carbon capture and storage. MAN Energy Solutions offers technology for small and large industrial plants to reduce emissions using this process.

**Shaping the future of decarbonization: first »MAN Energy Transition Reception« in London in November 2024**

**T**ransforming the energy sector towards more sustainable, lower-emission technology: That was the topic of the first »MAN Energy Transition Reception«, held in London on November 14, 2024. The event, formerly known as the »London Technical Symposium«, has been an institution in the industry for 44 years now. Around 100 executives, experts and engineers from the energy sector came together to discuss decarbonization and the challenges of the transformation towards sustainable, low-emission technology.

Howard White, Vice President of MAN PrimeServ Industries Europe, emphasized in his opening speech

that the transition to green technology requires cooperation, innovation and investments, and should incorporate the fossil fuel sector.

The conference focused on industrial heat pump solutions with lower energy consumption and emissions in sectors such as manufacturing and food technology, as well as the decarbonization of commercial shipping through technology for alternative fuels such as ammonia and methanol to achieve IMO decarbonization goals. Market development, technological advances and challenges in terms of Carbon Capture, Utilization and Storage (CCUS) were also important topics.



## Assessment of MAN Energy Solutions economic activities with regard to the EU taxonomy

With the European Green Deal, the European Union continues to pursue ambitious climate goals, despite growing economic challenges and geopolitical tensions. The long-term objective of climate neutrality by 2050 remains in place, but is increasingly being balanced against issues of energy security and competitiveness. The »Strategy for Financing a Sustainable Economy« published in 2021 with the central element of the »EU Taxonomy« serves as an important instrument for directing investments.

The EU taxonomy is a classification system for sustainable economic activities. It sets criteria for assessing economic activities, which are used to disclose whether an economic activity is ecologically sustainable.

An economic activity is considered eligible if it is listed in the EU taxonomy and can potentially contribute to the achievement of at least one of the six environmental objectives: climate change mitigation,

**Development of a new turbo-charger (TCF – Turbo charger high flow) to convert an established four-stroke engine (32/40CD) for significant fuel savings**

We are currently working on developing a new turbocharger series (TCF) which will be used to convert our four-stroke 32/40CD engine. This engine is built exclusively by licensees and is very popular. The model is set to remain on the market, but will consume significantly less fuel in the future thanks to a new TCF turbocharger. The TCF series has been developed for a variety of uses, such as small two-stroke engines or as a low-pressure stage for two-stage use. For the 32/40 engine specifically, using the TCF provides significantly improved specific throughput and partial-load efficiency compared to the current built-in NR turbochargers. This allows us to get rid of VIT (variable injection timing) and thus reduce costs. Consumption has also been reduced by approx. 5 g/kWh for this engine. Each 12V32/40 engine can thus save around 600 t of CO<sub>2</sub> p.a.



For appropriate tests with the new turbocharger and a 32/40CD, such an engine was initially borrowed from a licensee and imported into the EU. The engine was then subjected to various extensive tests on an engine test bench at our site in Augsburg together with a prototype of the TCF turbocharger, and the high potential fuel savings were confirmed.

The turbocharger is now ready for series production and is not only suitable for the 32/40CD, but also for engines with similar specific flow rates and charge air pressure conditions. The TCF turbocharger attachment will also be available as a retrofit solution for existing engines.





### New radial high-pressure turbocharger (TCP – turbo charger high pressure) offers improved performance and efficiency

Due to increasing power densities in four-stroke engines and the increasing development of combustion processes in H<sub>2</sub> engines towards high boost pressures, we have initiated the development of a new turbocharger product (TCP). Competitive pressure and the high costs of the two-stage charging systems required so far were further reasons for this step being made, and we want to underline our leading position when it comes to technology in this area in doing so.

In particular, the challenges we faced lay in designing a new type of compressor wheel, optimizing

the heat balance and modelling transient thermal processes through measurements and simulations. Our developments have resulted in a radial high-pressure charger designed for »plug & play«, which achieves a pressure ratio of 6.5 and improves efficiency by three percent compared to the previous series. This innovative product is suitable for upgrades as well as for new engine generations — with a particular focus on future applications in H<sub>2</sub> engines. In 2024, this series of turbochargers was ready for series production and sales approval was issued, and in 2025, the high-pressure turbocharger is set to be installed on the first engines.

climate change adaptation, sustainable use of water resources, circular economy, pollution prevention, and protecting biodiversity.

Economic activity can only be classified as aligned with the taxonomy if it makes a substantial contribution to one environmental objective, does not cause significant harm to other environmental objectives (Do-No-Significant-Harm, DNSH), and complies with minimum safeguards relating to human rights and labor standards.

The activities carried out by MAN Energy Solutions are linked to the environmental objective of climate change mitigation. We have identified our activities as eligible, with the exception of our new construction business involving heavy oil engines and individual components for extracting fossil fuels. To demonstrate the substantial contribution to climate change mitigation, we have developed a systematic method for calculating lifecycle greenhouse gas emissions.

The following economic activities carried out by MAN Energy Solutions are eligible:

#### **Economic activity 3.2: manufacture of plants for the production and use of hydrogen**

These include electrolyzers, complete hydrogen plants, and components for transporting, storing and processing hydrogen. The substantial contribution to climate change mitigation depends on the lifecycle GHG emissions of the hydrogen produced.

#### **Economic activity 3.6: manufacture of other low CO<sub>2</sub> technologies**

This includes new construction activities for gas and dual-fuel engines, industrial solutions for energy storage and sector coupling, as well as solutions for Carbon Capture Utilization and Storage (CCUS). It also includes service and after-sales business for upgrading existing plants. To demonstrate substantial contribution, proof must be provided that the products enable significant savings in lifecycle GHG emissions compared to alternative technologies.

#### **Economic activity 9.1: close to market research, development and innovation**

This is where we classify our licensing business, through which we provide development services in the form of manufacturing documents.

In the 2024 reporting year, the DNSH criteria were analyzed on a project-by-project basis and at site level. However, due to new EU requirements from July 2023, the requirements regarding substitution tests for Substances of Very High Concern could not be fully met, as the administrative and technical challenges represent a disproportionate effort in terms of implementation and control in view of the highly project-based business model.



### VIMPED: sustainable large engine development through virtualization

The development, calibration and project planning for powerful large engines involves extensive, resource-intensive testing, which results in high costs and emissions.

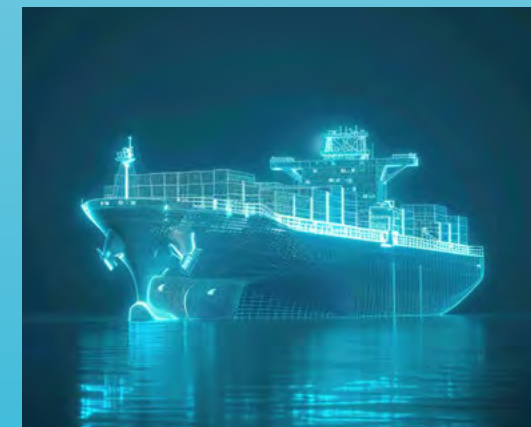
As part of the »VIMPED« project (»Virtual, Model-based Engine Performance & Emissions Development, Calibration & Customer Project Planning«), MAN Energy Solutions has developed an innovative method that addresses these challenges of conventional engine development and reduces costs and emissions: Virtual twins reproduce the real behavior of engines in models in detail. As a result, test volumes can be reduced, which significantly improves the efficiency, sustainability and quality of large engine development.

The method developed in 2023 and 2024 is being used for the first time for the 49/60 series. It will be validated in this series and integrated into the regular development process.

Virtualizing engine development is demanding: high-precision models that depict the real behavior of engines in detail are essential. Developing, validating, integrating and managing the models as well as analyzing the generated data

require special expertise. Such a project therefore requires the know-how and interdisciplinary cooperation of experts from various fields, such as thermodynamics, engine testing, data analysis and functional development.

In the short term, the project aims to reduce test time by 10 to 15 percent, which means a corresponding reduction in fuel consumption and CO<sub>2</sub> emissions, and thus an important contribution to sustainability. In the medium term, test time is to be reduced by more than 25 percent, which further increases the positive impact on the environment. Overall, VIMPED is an important step towards more sustainable engine development at MAN Energy Solutions.



## Concepts for measuring scope 3 and scope 4 emissions

An important component of our decarbonization activities is recording scope 3 emissions, i.e. the indirect emissions generated along our value chain — e.g. through upstream supplier processes and the use of our products — and taking appropriate measures to reduce them. In 2024, we developed a methodology for measuring and reporting our scope 3 emissions. This also allows us to formulate appropriate reduction targets and continuously review their progress and achievement. Since 2024, MAN Energy Solutions has also been integrated into VW's reporting process with its scope 3 emissions. Scope 3 emissions are published in VW's annual report as part of the CSRD. The key performance indicators are presented in the [»Key figures and additional information«](#) section of this report. It is important for us to point out that customers using our products accounts for the majority of scope 3 emissions. The overall scope depends heavily on the volume or mix of the products sold and their service life. We are constantly working to reduce these emissions — not least by developing new, more environmentally friendly solutions.

We use three different approaches to calculate emissions: The spend-based approach calculates emissions by multiplying the economic value of the goods and services



purchased by average emission factors. The distance-based approach determines emissions by taking into account the

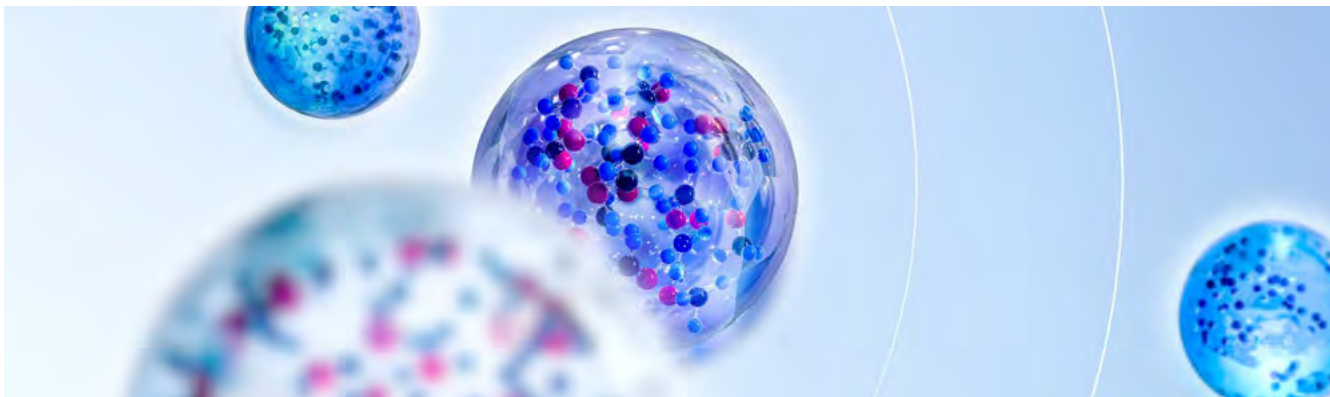
distance traveled, the weight of the goods and the means of transport, and multiplied by a corresponding emission factor. In the

average-based approach, the systems and machines that were put into operation during the year are taken into account by calculating their lifetime emissions. Among other things, we take into account running time, lifetime and energy used. To calculate and multiply with the other parameters, we use representative emission factors at both regional and sector-specific levels.

Another important part of monitoring our emissions is the systematic calculation of »Abated Emissions«, or scope 4 emissions. These are emissions reductions that occur outside a company's value chain through the use of its products or services. Many of our products help to avoid emissions during their usage phase. This includes our heat pumps, CCUS solutions, PEM electrolyzers, green fuel-powered engines and retrofit parts.

Since the calculation and allocation of scope 4 emissions is only in the development phase, product-specific questions are still unresolved. The availability and quality of data are also a challenge. We are currently developing a suitable calculation method to be able to consistently and comparably portray the emissions prevented by our products in the future. The aim is to make our contribution to global emissions reductions measurable.

# Decarbonization through climate-friendly engines



**W**e are helping to shape the future of the shipping and energy industries by developing engines that run on alternative fuels and that will play a crucial role in decarbonization and the energy transition.

The International Maritime Organization (IMO) estimates annual emissions from shipping at just over one billion tons of carbon dioxide. This corresponds to just under three percent of all greenhouse gas emissions worldwide — and things are expected to change soon: In 2023, IMO member states adopted a revised greenhouse gas strategy. The goal is now net-zero emissions by 2050. This new orientation sets indicative emission reduction targets for 2030 (20 percent mandatory, 30 percent targeted) and 2040 (70 percent mandatory, 80 percent targeted) and takes into account greenhouse gas emissions over the entire life cycle, from production to combustion of fuels.

For us, it is clear that the key to achieving this ambitious goal is the development of engines and infrastructure that enable the industry to use more climate-friendly and carbon-free fuels on a large scale. We see ourselves as an active driver of the maritime energy transition and are therefore promoting the use of a variety of synthetically produced, climate-friendly fuels in our engines, such as synthetic natural gas (SNG). In the future, other what are known as »future fuels« such as ammonia or »green« methanol will play an important role.

We also have more environmentally friendly solutions in our portfolio for stationary gas engines in power plants: For example, our engines can already be operated with a 25 percent hydrogen admixture. A 100-percent hydrogen plant is currently under development.

## New cogeneration plants in Chemnitz reduce CO<sub>2</sub> emissions by 60 percent

**W**ith the »New Heat for Chemnitz« project, the energy supplier eins energie is replacing two coal-fired power plants with modern cogeneration plants (CHP) in Saxony (Germany). The new gas engine power plants MHKW Chemnitz-Nord and Altchemnitz will supply 150 megawatts of electricity and over 130 megawatts of heat, which will supply around 40 percent of the population with energy in the future. Our cutting-edge CHP technology enables a 60 percent reduction in CO<sub>2</sub> and helps to stabilize the energy grid and better integrate renewable energy sources. Chemnitz is thus on the way to a climate-friendly future.





### MAN Energy Solutions receives approval for ammonia fuel supply system

**MAN Energy Solutions Sweden received an AIP certificate (Approval-in-Principle) from classification societies DNV and Bureau Veritas in January 2024 for designing an ammonia fuel supply system to safely supply marine engines with ammonia.**

MAN Energy Solutions is a leader in the storage and handling of liquefied petroleum gas and natural gas. Together with Yada Green Energy Solutions, a Chinese company we have already worked with to deliver equipment for marine fuels LNG and methanol, a concept has now been developed for a safe, reliable ammonia fuel supply system that does not release ammonia and comprises an ammonia scrubber and a containment system. In the event of a leak on board, this prevents the toxic ammonia from escaping and harming people and the environment. The project is currently still in the preparation phase. The fuel supply system could be an essential part of future ammonia engines and highlight MAN Energy Solutions' pioneering role in developing fuel supply systems for new fuel solutions.



#### MAN Cryo

At our Gothenburg (Sweden) site, we provide with MAN Cryo system design and technical solutions for the storage, distribution and handling of liquefied gases and sees ourselves as a pioneer in the shipping sector. In 1999, MAN Energy Solutions delivered with MAN Cryo the world's first LNG fuel gas system for the »Glutra« ferry in Norway and in 2013 the world's first bunker vessel, the »SeaGas«, which is used in Stockholm. We recently signed the first contracts for the construction of methanol supply systems and delivered the first liquid hydrogen fuel gas system for a ship.

### »AmmoniaMOT 2«: MAN Energy Solutions starts research project to develop a medium-speed ammonia engine

**To make maritime shipping climate-neutral by 2025, carbon-neutral or carbon-free fuels are essential. Various industrial partners and research institutes have therefore been working together on the development of a four-stroke ammonia engine since August 2024.**

While progress has already been made on the development of the two-stroke ammonia engine, the pace is now picking up for four-stroke engines too: In August 2024, under the leadership of MAN Energy Solutions, the »AmmoniaMOT 2« research project was launched with partners from industry and research to develop a medium-speed four-stroke dual-fuel demonstrator engine powered by ammonia. It could be used, for example, in cargo or special ships or as an auxiliary unit for large ammonia-powered ships with two-stroke engines as the main drive.

#### The goal: development of a full-size prototype engine

Ammonia as a fuel poses particular challenges: It is toxic and has poor combustion properties. For this reason, a new combustion concept and special components are required for it to be used in combustion engines. The AmmoniaMOT2 research project aims to prove that the technology can be used in four-stroke

medium-speed engines and that greenhouse gas emissions can thus be reduced by at least 90 percent compared to current drive solutions.

To this end, the research team is developing a prototype engine and individual system components, such as the intrinsically-safe fuel supply system, which is built and tested in original size. This also includes the development of new components such as the injector, fuel system, safety system, exhaust gas aftertreatment, etc. In addition, two different combustion principles are compared.

#### AmmoniaMOT2 builds on findings from the previous project

AmmoniaMOT 2 is the successor project to AmmoniaMOT, which was successfully completed in May 2024 with fundamental investigations into ammonia combustion in internal combustion engines. The promising results obtained here form the basis for AmmoniaMOT 2.

The project is designed to run for 42 months and is funded by the Federal Ministry of Economics and Energy (BMWE).



# Decarbonization through retrofit solutions

Our retrofitting business, i.e. the business of technologically retrofitting existing products and systems, makes another important contribution to the maritime energy transition and decarbonization of the global power plant park: Upgrade and conversion are essential services in the range offered by our aftersales brand MAN PrimeServ. A retrofit not only extends the life of engines and systems and thus makes an important contribution to the efficient use of resources, but can also significantly reduce their CO<sub>2</sub> emissions, by converting them to operate with alternative fuels such as carbon-neutral methanol, for example.

We are continuously expanding our retrofit solutions to drive the decarbonization of existing plants forwards. Various regulations and legislative changes are supporting the trend towards converting products and systems already in the field to lower-emission or emission-free fuel variants. On 1/1/2023, for example, the International Maritime Organization (IMO) introduced the Energy Efficiency Existing Ship Index (EEXI), according to which commercial and cruise ships over 400 GT (gross tonnage) require an energy efficiency certificate. The Carbon Intensity Indicator (CII) also came into force together with EEXI. The aim is to align the operation of ships with strict CO<sub>2</sub> emission values, so that the entire shipping industry makes an important contribution to achieving the 1.5 degree target laid down

in the Paris Agreement to mitigate climate change. These regulations make decarbonization roadmaps and strategies for CII compliance and improvement necessary, as well as measures to reduce fuel and energy consumption. This includes operational and logistical changes, weather-related route changes, speed optimization, efficiency measures and the use of alternative fuels.

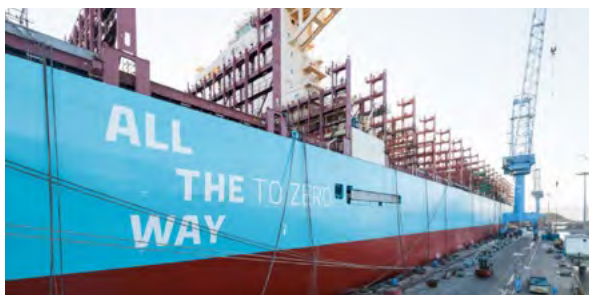
Against this backdrop, there is enormous potential in our Retrofit division: Since the average lifespan of ships is often more than 25 years, decarbonization can only be achieved if it also includes retrofitting older ships. According to our estimates, around 3,700 marine engines currently have the potential for such a fuel upgrade.



## Retrofitting floating power plants

The Turkish company Karadeniz supplies floating power plants to areas of the world in need of electricity. MAN Energy Solutions is helping Karadeniz improve its environmental footprint by converting heavy oil engines to dual fuel. MAN PrimeServ is currently upgrading four plants with a total of 32 engines to dual-fuel operation.





**Blueprint for future projects and a world first:  
MAN PrimeServ converts a container ship to run on methanol**

**In December 2024, MAN Energy Solutions was able to announce the successful conversion of the »Mærsk Halifax« to a MAN B&W dual-fuel ME LGIM engine. The major project, carried out by MAN PrimeServ together with Xinya Shipyard, is the world's first retrofit of such a large container ship — and is thus groundbreaking for the decarbonization of maritime shipping.**

A.P. Møller Mærsk is a leading global logistics service provider and operates in more than 130 countries. The company has set itself the goal of achieving net zero emissions by 2040 with new technology, new ships and alternative fuels. A decisive milestone on this journey is the conversion of the 15,000 TEU container ship »Mærsk Halifax« to a more climate-friendly drive system.

**CO<sub>2</sub> emissions reduced by 90 percent**

Originally, the ship, which went into operation in 2017, was powered by a MAN B&W 8G95ME-C9.5 engine. In June 2023, A.P. Møller Mærsk and MAN Energy Solutions signed a contract for the conversion to an 8G95ME-LGIM-MK10.5 engine. This enables Mærsk Halifax to operate with environmentally friendly methanol and reduce their CO<sub>2</sub> emissions by around 90 percent as a result.

One of the outstanding features of the upgraded dual-fuel engine is its ability to switch between fuels with minimal interruption. This flexibility is critical to maintaining operational efficiency and reliability.

Extensive preparations for the retrofit took place from June 2023 to August 2024, and the retrofit itself was carried out at a shipyard in China from August 2024 to October 2024. The pure implementation time spent on this very complex project, including tests and test drives, was 83 days in total. Since November 2024, the Mærsk Halifax has been back in operation and serves the logistics company's Trans-Pacific route.

**A milestone on the road to more environmentally friendly shipping**

Retrofitting the container ship was a challenging project for various reasons: It was the first retrofit of its kind in the world and required an international team to seamlessly collaborate across various disciplines and time zones. The fact that it was successfully completed within the specified time frame makes the Mærsk Halifax conversion an extremely gratifying project and an important milestone on maritime shipping's journey from fossil to low-emission fuels. The valuable knowledge and experience gained in this way serves as a blueprint for future retrofitting projects. In fact, A.P. Møller Mærsk has already placed advance orders with MAN PrimeServ to retrofit a further ten ships in its fleet to run on methanol. These retrofits will be carried out between 2027 and 2029.

»CliNeR-Eco« project: Research network develops methanol retrofit solutions for medium-speed marine engines

MAN Energy Solutions, WTZ Rosslau gGmbH and TU-Darmstadt have teamed up to work together on the development of retrofit solutions for medium-speed marine engines. The »CliNeR-Eco« research project is being funded with around five million euros from the German Federal Ministry of Economic Affairs and Energy.

The »CliNeR-Eco« project, short for »Climate Neutral Retrofit – Engine Concepts«, was launched in 2023 and is scheduled to go on for three years, lasting until the end of 2025. The aim is to develop and test retrofit concepts for various existing medium-speed marine engines which are suitable for retrofitting entire ship fleets with reasonable economic and technical costs. The focus here is on the climate-neutral fuel methanol, which is produced from green hydrogen. This is intended to achieve an emissions reduction of at least 60 percent, which enables ship owners to meet the emission targets of the International Maritime Organization (IMO) and the EU with their existing fleets.

The work done as part of CliNeR-Eco includes, for example, the analysis and evaluation of fuel systems, combustion processes, exhaust gas aftertreatment, safety systems and engine control within the scope of concept studies. Initial project successes from work in 2023 and 2024 have already been transferred to downstream development projects, such as retrofit projects for the 21/31 or 48/60 engine.



cliner  
eco

climate neutral retrofit  
engine concepts



# Decarbonization with green hydrogen

**H**ydrogen is one of the key elements in a decarbonized economy and offers enormous potential: For example, the German Energy Agency has calculated that 95 percent of carbon emissions could be saved if hydrogen replaced coal in the steel industry's blast furnaces.

Hydrogen is also interesting as a climate-friendly fuel for ships and serves as a basis for the production of various synthetic fuels such as green methane, methanol or ammonia using Power-to-X processes. These »green« fuels point the way to a climate-neutral future in sectors where direct electrification is not possible — such as shipping or aviation.

Hydrogen technology also plays an important role as an enormous lever for decarbonization within MAN Energy Solutions: MAN Energy Solutions has extensive know-how in generating, transporting, storing and converting green hydrogen. From PEM electrolysis to Power-to-X technology through to H<sub>2</sub>-compatible engines: Our portfolio covers the entire value chain for hydrogen — from production to use.

In the coming years, we will also invest up to 500 million euros in our subsidiary Quest One (formerly H-TEC SYSTEMS) to become a leading mass producer of PEM electrolyzers. Here, we are striving for a position in the top three worldwide and thus are significantly contributing to reducing global CO<sub>2</sub> emissions. Quest One is already successful on the market today with solutions for the electrolysis of hydrogen and offers its customers integrated container solutions in the megawatt range.

## HydroPolen: MAN Energy Solutions is developing hydrogen concepts for maritime use together with industry and science

**Back in September 2022, MAN Energy Solutions signed a partnership with leading industrial companies and research institutes to develop engine concepts for hydrogen-powered, medium-speed engines in the maritime sector. The project, called »HydroPoLEn«, is supported and financed by the German Federal Ministry of Economic Affairs and Energy**

HydroPoLEn combines the know-how and resources of industry leaders from the cruise sector (Carnival Maritime GmbH) and the marine propulsion industry (MAN Energy Solutions) with those of a supplier of key components (Tenneco Inc.) and renowned research institutes that specialize in pioneering green energy solutions (WTZ Rosslau gGmbH, Technical University of Munich Department of Sustainable Mobile Drive Systems).

Through knowledge exchange and multi-disciplinary research, innovative key technology, such as injection, ignition and advanced tribological systems, are to be developed and drive systems used in shipping are to be redesigned.



In 2024, based on single-cylinder engine tests, we were able to derive a concept for operating a retrofit engine that achieved a significant CO<sub>2</sub> reduction for common driving cycles. The biggest challenge is currently the development of components that enable high power density and, at the same time, safe operation of the hydrogen-powered single-cylinder research engine. Some of these engine components are already available and will be tested on the test bench in 2025. The project will run until February 2026.



### MAN Energy Solutions develops hydrogen supply for Norwegian net-zero ferries

**Norwegian ferry company Torghatten Nord A/S is using MAN Cryo's expertise to design and build two new hydrogen-powered ferries. They will operate Norway's longest passenger route with zero emissions.**

The project is based on an initiative run by the Norwegian government: In the future, the large ships on the demanding route between the mainland and Lofoten will operate with green, compressed hydrogen and thus completely emission-free.

The contract in this tender went to the Norwegian ferry company Torghatten Nord A/S, which will now build two completely new, hydrogen-powered ships for this purpose. The particular challenge of this project: On board the ships, large quantities of hydrogen must be stored in bottles safely where they cannot be affected by environmental influences, which is not at all easy in the harsh climate of Lofoten.

#### **MAN Cryo minimizes risks associated with hydrogen operation**

MAN Energy Solutions supports the realization of this ambitious project through MAN Cryo, an expert in cryogenic systems for the storage, distribution, and handling of gases such as liquefied petroleum gas and

natural gas. The company is responsible for detailed planning for bunker systems on board, hydrogen lines and ventilation masts for the ships. MAN Energy Solutions also does the design and engineering for modularized fuel gas system skids, which reduce the pressure of hydrogen from the storage location to the fuel cell plant. These can be integrated on the ship and minimize the risks associated with operation. MAN Energy Solutions also acts as a system integrator for the hydrogen plant and coordinates cooperation with other important suppliers in the project.

The two new ships are being designed by the Norwegian Ship Design Company. Its hull is built by the Cemre shipyard in Turkey, then towed to the Myklebust shipyard in Norway and kitted out there. All hydrogen equipment will also be installed in Norway. Both ships are to be delivered to Torghatten Nord A/S in 2026.

#### **Order underscores MAN Energy Solutions' leading role in the development of pioneering fuel systems**

By commissioning, the ferry company Torghatten has extended its cooperation with MAN Energy Solutions from LNG to hydrogen. The two partners have already completed several projects together in the past.

»This new order underlines the leading role MAN Energy Solutions plays in developing pioneering fuel systems for the maritime sector. Thanks to our focus on advanced technology, tailor-made design and seamless integration capabilities, our team of specialists at MAN Cryo is setting new standards when it comes to sustainable ship operation.«

**Henrik Malm,**  
Managing Director MAN Energy Solutions Sweden

# Decarbonization with heat pumps

The energy transition is also a heating transition, as more than 50 percent of final energy consumption and around 40 percent of global carbon emissions come from heat generation. Against this backdrop, heat pumps are a powerful solution for decarbonizing heat generation, not only for individual houses, but also for large applications — and are therefore of interest to companies and municipalities. For example, 25,000 households can be supplied with zero-emission heat through a 60 MW heat pump solution.

Electrically-powered heat pumps use various heat sources such as lakes, rivers, oceans, sewage, industrial waste heat, geothermal energy or ambient air, efficiently and with low emissions, instead of fossil fuels. Alternatively, heat pumps can also be powered by electricity from renewable energy sources, which ensures a completely climate-neutral heat supply.

The construction of large heat pumps is another important strategic area for MAN Energy Solutions: The market for heat pump solutions has recorded double-digit annual growth over the last ten years. The greatest potential lies in the industrial sector, which is responsible for around half of the global CO<sub>2</sub> emissions from heat generation, and in district heating. We see great potential for our solutions here.



### MAN Energy Solutions commissioned with another heat pump unit for heating plant in Aalborg

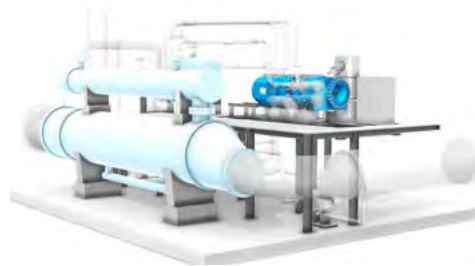
**The Danish district heating utility company Aalborg Forsyning commissioned MAN Energy Solutions back in 2023 to supply three heat pump units for the large district heating plant that supplies heat to the Danish city of Aalborg. The follow-up order came in June 2024: MAN Energy Solutions is now building a fourth heat pump unit, which increases the total heat output of the heating plant to 177 MW. This makes the unit one of the largest units installed in a district heating plant in the world.**

Mikael Adler, Head of Sales and Project Management Heat Pumps at MAN Energy Solutions, explains: »This follow-up order from Aalborg Forsyning underlines the strong trust placed in our heat pump technology. We are pleased to continue our cooperation on this important project and to support Aalborg on its journey to climate-neutral district heating. The integration of this fourth heat pump unit will further boost the environmental friendliness of the city's district heating network.« The district heating plant replaces the city's coal-fired power plant, which is to be shut down in 2028, thus reducing CO<sub>2</sub> emissions.

#### Warming seawater with electricity from renewable energy sources

The basic principle of heat pump technology is the conversion of electrical energy into

thermal energy. The location of the district heating plant in Norbis Park on the northern shore of the Limfjord makes it possible to use seawater as a heat source. The heat pump units are powered by electricity from Aalborg Forsyning's renewable energy sources and raise the seawater temperature from 1 to 15 degrees to up to 98 degrees Celsius.



In total, the plant will supply up to 700,000 MWh of heat annually, which corresponds to a third of Aalborg's heat production. Seawater heat pumps are therefore a key element in Aalborg's transition from coal-based to more climate-friendly district heating.

#### Sophisticated technology and an environmentally safe refrigerant

The core element of Aalborg's future heat pump system consists of four oil-free, hermetically-sealed HOFIM® compressor units, which are currently being manufactured

and tested by MAN Energy Solutions in Zurich (Switzerland). The compressor systems use high-speed engines and active magnetic bearings, which means that they can be operated without a dry gas sealing system and oil system. An important feature of our technology is the use of toxicologically and environmentally harmless CO<sub>2</sub> as a refrigerant for the entire system cycle. What's more, the solution enables electric grid capacity to be quickly balanced, and it thus supports the integration of intermittent power generation such as solar and wind energy. The order also includes a long-term service agreement with MAN PrimeServ,

including MAN PrimeServ Assist for real-time monitoring, data analysis and diagnostics for compressor technology.

MAN Energy Solutions is carrying out the project in collaboration with two partners: Bilfinger is responsible for planning and building the mechanical systems, while ACS is responsible for planning and implementing the electrical infrastructure. The involvement of these partners from the start of the project and the collaboration between MAN Energy Solutions and Aalborg Forsyning ensure seamless integration into the heat pump system.



Visualization of the new heating plant with large heat pump in Aalborg

## MAN Energy Solutions supplies large heat pump for new Scout Motors plant

**MAN Energy Solutions is using a large heat pump to electrify heating and air conditioning at Scout Motors' new electric car plant in South Carolina, USA.**

The major project for MAN Energy Solutions is also part of a billion-dollar investment by Volkswagen AG in its subsidiary Scout Motors Inc., which produces all-electric pick-up trucks and SUVs: MAN Energy Solutions will supply a large heat pump system for the company's new production facility in Blythwood in the heart of South Carolina. The plant is designed for an annual production capacity of over 200,000 electric vehicles. The symbolic groundbreaking ceremony took place in February 2024.

### High requirements for heating and cooling technology

With an area of around eleven square kilometers, the requirements for heating and cooling technology for this plant are particularly high. In addition, CO<sub>2</sub> neutrality and the highest possible energy efficiency should be ensured. We meet these requirements with a

25 MW heat pump system, which consists of two compressors, each with an output of 12.5 MW, built at our Oberhausen site.

While both compressors are used for cooling, only a single system is needed to cover the entire heat demand. To do this, it uses the heat pump's ability to draw thermal energy from ambient air and meets the plant's heating and cooling demand without generating any CO<sub>2</sub> emissions. Electric engines, process equipment such as condensers, coolers, evaporators, pipelines and a control system come included. »This project could serve as a blueprint for future production sites in the USA and across the globe,« says Dr. Uwe Lauber, CEO of MAN Energy Solutions.

### Milestone on the road to CO<sub>2</sub> neutrality

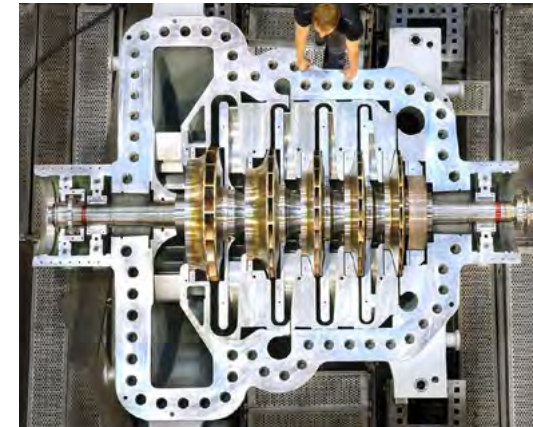
By investing in large heat pumps, the participating companies are setting an example for a sustainable future, as heat pumps make a significant contribution to a sustainable supply of heating and cooling, both from an ecological and economic perspective.

»This project could serve as a blueprint for future production sites in the USA and across the globe.«

Dr. Uwe Lauber,  
CEO of MAN Energy Solutions



Visualization of the new Scout Motors plant



Cross section of a compressor



Groundbreaking ceremony for the new plant in Columbia, USA

# Decarbonization through carbon capture, utilization and storage (CCUS)

**E**nergy production and use must be comprehensively transformed to achieve the goals of the Paris Climate Agreement and curb climate change. Carbon capture, utilization and storage (CCS) technologies can play a central role in this.

CCS technologies in particular offer very energy-intensive and high-emission industries, such as the cement industry, the opportunity to minimize their greenhouse gas emissions and thus contribute to decarbonization. This is because CO<sub>2</sub> emissions are an inevitable part of their processes.

This is where our solutions come in: We supply the necessary compression technology for the various CO<sub>2</sub> gas streams within the separation process (amine scrubbing, cryogenic processes, pressure swing adsorption, membrane technologies, etc.) and thus integrate the compression tasks for CO<sub>2</sub> liquefaction or the feed to the pipeline for the transportation of supercritical CO<sub>2</sub>.

We also offer advanced process components and turbomachinery solutions such as closed water cooling circuits and process solutions with heat and energy recovery. We further expanded our commitment in this area in 2024.

## Carbon capture at Heidelberg Materials prevents 440,000 tons of CO<sub>2</sub> per year

**A**s one of the largest manufacturers and distributors of building materials worldwide, Heidelberg Materials has set itself the goal of making the production of its entire product portfolio climate-neutral by 2050. To this end, Norcem, a subsidiary of Heidelberg Materials in Brevik (Norway), built and commissioned the world's first carbon capture system for a cement plant in 2024. This is currently being put into operation. The plant was developed jointly by MAN Energy Solutions and SBL Capturi (a joint venture between Aker Carbon Capture and Schlumberger).

The new carbon capture heat recovery (CCHR®) technology uses the compression heat of the multi-shaft geared compressor to generate steam, which is fed back into the CO<sub>2</sub> separation process, thus reducing the energy consumption of the separation system by more than 30 percent.



Around 440,000 tons of CO<sub>2</sub> annually and approx. 50 percent of the Brevik plant's total emissions are captured, compressed, liquefied and transported by ship to Bergen (western Norway). From there, a pipeline leads to an underground storage location in the North Sea. Taking into account the life-cycle greenhouse gas emissions of the entire process chain (capture, compression and transport), this results in a net emission reduction of around 330,000 tons of CO<sub>2</sub> per year.

## MAN Energy Solutions supplies compressor technology for major Dutch CCS project »Porthos«

**It is a milestone for the Netherlands on its path to climate neutrality — and one of the largest such projects in the world: The Port of Rotterdam Authority, Energie Beheer Nederland B.V. (EBN) and N.V. Nederlandse Gasunie are working together to implement the CCS (Carbon Capture & Storage) project »Porthos«. Up to 2.5 million tons of CO<sub>2</sub> are captured and stored each year.**

The Rotterdam port area is a region that is responsible for over 16 percent of the Netherlands' CO<sub>2</sub> emissions. This is set to change with the »Porthos« project — short for »Port of Rotterdam CO<sub>2</sub> Transport Hub and Offshore Storage«: Up to 2.5 million of CO<sub>2</sub> per year from various companies such as Air Liquide, Air Products, ExxonMobil and Shell will soon be captured and stored under the North Sea.

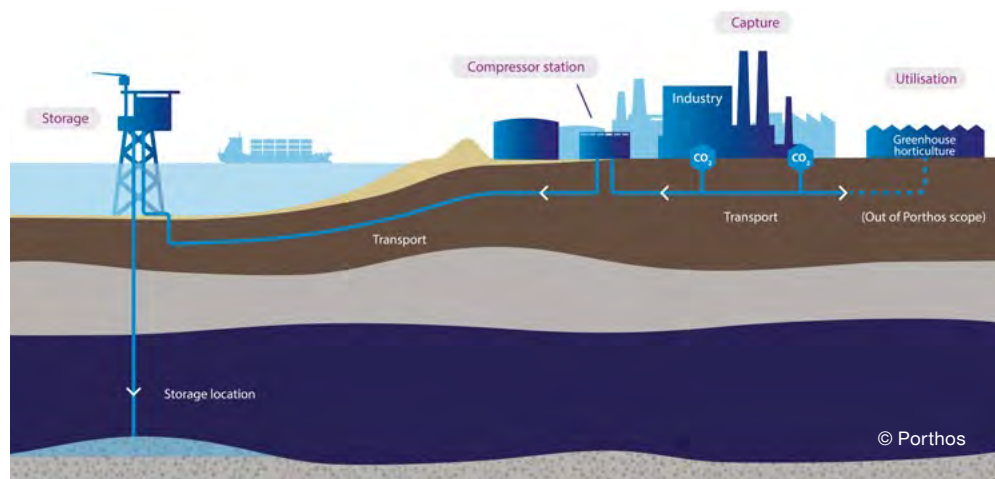
The aim is to create a CO<sub>2</sub> transport and storage infrastructure for several companies. Such groundbreaking initiatives are key when it comes to driving CCS efforts forwards and effectively reducing hard-to-abate emissions.

### MAN Energy Solutions is part of the pioneering project

MAN Energy Solutions is making a major contribution to this project, which is recognized by the European Union as a Project of

»This significant order consolidates MAN Energy Solutions' technological leadership.«

**Dr. Marco Ernst,**  
Head of Sales & Project Management CCS



Common Interest (PCI): In October 2023, we won the contract to supply three RG 28-6 compressor trains with integrated transmission (RG) and individual operating stages with their own optimized shaft speeds. These are ideal for CO<sub>2</sub> compression under very high-pressure conditions.

The compressor trains are expected to be ready for delivery in mid-2025. »This significant order consolidates MAN Energy Solutions' technological leadership as a provider of state-of-the-art CO<sub>2</sub> compression solutions«, says Dr. Marco Ernst, Head of Sales & Project Management CCS at MAN Energy Solutions.

### Gas fields with a storage capacity of 37 million tons of CO<sub>2</sub>

The MAN Energy Solutions compressor trains are being installed in a plant on the

Maasvlakte, the artificial western extension of Europoort. There, the CO<sub>2</sub> is compressed to various outlet pressure levels — up to a maximum of 180 bar — and each compressor can process up to 250 tons of CO<sub>2</sub> per hour. From the compressor station, a 22 km long pipeline will transport the CO<sub>2</sub> in a gaseous state to the P18-A platform in the North Sea, where it will be pumped into the former P18 gas fields at a depth of 3,200 to 3,500 m. The gas fields have a CO<sub>2</sub> storage capacity of around 37 million tons. The system should be operational by 2026. In the future, the CCS project could be expanded to include the option of using the stored CO<sub>2</sub> on an industrial scale.





# Nature

## Our motivation

As a company, we see ourselves as part of the solution to overcoming the challenges of climate change the best we can and we want to be a role model for others in all areas of business through consistent, sustainable action.

## Our ambition

Our goal is to achieve net-zero emissions in our own operations by 2050, decarbonize our supply chain and drive the transition to a circular economy forwards.

## Our goals

We will half the CO<sub>2</sub> emissions from our own production (scope 1 and scope 2) by 2030 compared to 2018.

**CO<sub>2</sub> emissions scope 1 and 2:**  
≤ 54,000 t (-50 percent) | 2030

By 2030, we want to generate six percent of our own energy demand from renewable sources.

**Regenerative self-production:**  
≥ 6 percent | 2030

## Alignment and strategy

**Climate change, the overuse of resources, the destruction of habitats and the loss of biodiversity are now serious problems that threaten the basis of our existence on Earth. Against this backdrop, reducing and preventing emissions, using resources responsibly, and protecting ecosystems and biodiversity are not only ethical obligations, but also practical necessities for the preservation of life.**

**A**s a large manufacturing company, we have a huge responsibility for nature and environmental protection. Various regulations, standards and voluntary requirements form guidelines for our actions in this area and are an essential part of our strategic mission statement. In general, we take a much broader view of our obligations than the legal requirements in many respects. A particular focus here is on the decarbonization of our sites, the decarbonization of our supply chain, the responsible use of resources and the circular economy as well as the protection of biodiversity.

Management systems are of central importance in these efforts and in achieving our goals. These support our systematic

approach and help us to fulfill all legal, normative and voluntary obligations and continuously identify potential for improvement.

Our integrated management system (IMS) currently covers the areas of quality management, environmental management, and occupational health and safety. It enables us to easily integrate other management systems and make optimum use of existing synergies. One example of this is the implementation of the energy management system in accordance with ISO 50001, which will be introduced at our German sites in 2025 and integrated into the IMS.

With regard to environmental protection, our environmental management system



(EMS), thanks to which all twelve production sites have long been certified in accordance with ISO 14001, deserves special mention. It helps us to better comply with environmental and energy regulations and to minimize risks in connection with environmental and energy issues. Furthermore, by using this system and the associated ISO 14001 certification, we position ourselves in the public eye as a responsible, committed and forward-looking company. In addition, our current EMS and the EnMS that will be introduced in 2025 help us to regularly review our processes and find solutions to work in an even more resource- and energy-efficient manner.

Since 2021, we have also been using a new Compliance Management System Health, Safety and Environment (CMS-HSE), which has expanded our environmental protection and occupational safety requirements to include additional aspects and established a standardized, transparent process that can be used to report suspected irregularities quickly and effectively if necessary.

### Harmonization of selected environmental management processes as part of the EMS in accordance with ISO 14001

As part of the introduction of multi-site certification, we began to gradually harmonize the environmental management systems of 15 European production and non-production sites in 2023 — including in terms of the environmental aspect assessment. The EMS at our twelve production sites have long been certified in accordance with ISO 14001.

To this end, we developed a central guideline with corresponding evaluation templates in 2023 and 2024 and trained up site employees accordingly. The evaluation by the sites in accordance with the specifications took place from the end of 2023 to

August 2024. As of today, 15 sites will work in accordance with the central specifications from the multisite certification. Further sites will follow in the coming years.

We expect this step to ensure compliance with our legal and binding obligations, improve our environmental performance, and contribute to achieving our environmental and climate targets. We also want to facilitate knowledge transfer through the transparent presentation of site assessments, share best practice experiences and thus increase our efficiency.

One particular challenge was to define a process that was as user-friendly and transparent as possible, taking into account all the local particularities — because our sites vary in size, complexity and tasks. The

project team visited the sites involved in person to get to know each site's respective particularities and to jointly develop and implement the process.

The evaluation of environmental aspects serves to identify environmental objectives, define and implement effective measures, and thus achieve the relevant objectives. Headline targets are set. However, if a site identifies site-specific issues as part of its environmental aspect assessment, the site can also define a site-specific target for this.

The first harmonized environmental aspect assessment according to uniform and central specifications was carried out for the first time in 2024. We have identified potential for improvement, from which we are now analyzing and deriving appropriate measures.



### Introduction of a certified energy management system in accordance with ISO 50001:2018

**M**AN Energy Solutions has decided to introduce an energy management system (EnMS) at all six German sites and to aim for ISO 50001:2018 certification in 2025. The aim is to use the EnMS to help achieve even more decarbonization and resource conservation, thereby also saving costs. At the Augsburg, Berlin, Deggendorf, Oberhausen, Ravensburg and Hamburg sites, preparatory measures were already carried out in 2024, such as a gap analysis and an energy assessment. The implementation is supported by an external service provider to ensure that all relevant obligations are met in full and on time.



# Decarbonization of our own production sites

**W**e are still committed to reducing absolute CO<sub>2</sub> emissions at our own production sites by 50 percent by 2030 compared to 2018.

This includes our Scope 1 and Scope 2 emissions. This also includes emissions caused by our administrative departments and those generated by engine test runs, for example.

We are well on track to achieve our target: We have reduced our CO<sub>2</sub> emissions in 2024 by around 63 percent compared to the reference year 2018 — and have therefore actually exceeded our current target. However, maintaining this reduction path until the target year of 2030 will remain challenging due to various developments: We expect growth to have a negative impact on CO<sub>2</sub> emissions in the coming years. In addition, alternative technologies (e.g. for certain heat treatment processes) are not yet technologically mature. Thirdly, alternative and competitive fuels (e.g. bio-methane, hydrogen) are not yet sufficiently available in the required quantity and quality.

We are currently developing a decarbonization strategy in accordance with the Science Based Targets Initiative (SBTi), which defines standards for developing emission reduction targets in line with the Paris Agreement. Volkswagen already has climate targets that meet the requirements of SBTi and have been confirmed. The targets for the production phase (Scope 1 and 2), which also include MAN Energy Solutions CO<sub>2</sub> emissions, contribute to limiting global warming to 1.5 degrees Celsius in accordance with the Paris Agreement.



MAN Energy Solutions site Augsburg



To reduce CO<sub>2</sub> emissions at our own production sites, we are pursuing a package of measures that comprises three key elements and is cascaded accordingly. These elements are:

1. Increasing energy efficiency and saving energy by renewing, converting and optimizing systems, infrastructure and processes, with the aim of saving 32,000 MWh/a by 2030.
2. Generating our own energy from renewable sources (e.g. electricity from photovoltaics, heat from heat pumps): We want to generate six percent of our own electricity requirements from renewable sources by 2030.
3. Transformation from fossil fuels to more climate-friendly fuels (operational heat generation, heating processes in production).

The challenge here is that we have already implemented many easy-to-implement measures — which means that what we can do now is much more complex, such as the energy-efficient refurbishment of the building envelope. In addition, the return on investment or amortization period for these measures is usually several decades. There are also obstacles to the installation of photovoltaic systems, as many old hall roofs are not suitable for this or first need to be structurally reinforced, which is not profitable or cannot be achieved during ongoing production. The legal framework conditions do not always make things easy for us either: For example, in some cases it is unclear which standards apply, or there is too high a rate of change.

Nevertheless, in 2024 we succeeded in sending a powerful signal for sustainable energy with various initiatives in these areas and demonstrating how innovative solutions can help reduce costs and boost environmental performance: Overall, our greenhouse gas balance across all sources has improved by 6,147 tons of CO<sub>2</sub> (13 percent) compared to the previous year, with almost the same total energy consumption (-3 percent) and production hours (-1 percent).

A large proportion of the CO<sub>2</sub> saved has been achieved through measures to increase energy efficiency, the switch to low-CO<sub>2</sub> or CO<sub>2</sub>-neutral energy sources, and the increased use of self-generated solar power.

We were able to increase energy efficiency across various energy sources such as electricity, district heating and natural gas, thus achieving calculated savings of 2,811 MWh/a purely from measures that have been confirmed as effective — only these may be included in the calculations. We achieved 80 percent of the energy savings in the areas of lighting and the building envelope.



## Networking for climate protection: Energy efficiency and climate protection initiatives

An important building block for the implementation of targeted and successful measures to increase energy efficiency, to generate our own electricity from renewable sources, and to generate heat from more environmentally friendly fuels is the internal and external exchange of information and experience in line with our best practice approach.

Several events were also held in 2024 at which we developed some key stimuli: For example, MAN Energy Solutions hosted the Volkswagen Group Energy & CO<sub>2</sub> working group for the first time at the beginning of March. We have been actively involved with this since 2014. Over 40 experts from many international affiliated companies were guests at the MAN Museum Augsburg for two days. The focus was on heat pumps.

In November, our own MAN Energy Solutions Energy & CO<sub>2</sub> working group took place for the 15th time, bringing together relevant participants from five Volkswagen sites, guests from MAN Truck&Bus and external experts. The main topic here was waste heat utilization.

MAN Energy Solutions representatives also took part in two Energy & Climate Committee meetings of the German Association of Energy Consumers (VEA), in which we have been active since 2016. The association is dedicated to cross-company and cross-industry exchange on relevant specialist topics and is also committed to presenting the requirements and experiences of companies to legislators so that laws are designed to be practical and compliant. The main topic was an initiative to reduce bureaucracy.



QuestOne site Hamburg

### Infrastructure and system optimization: Quest One opens a new, energy-efficient GigaHub in Hamburg

**Our subsidiary Quest One (formerly H-TEC SYSTEMS) completed a major construction project in 2024: In September, the new development and production facility for PEM electrolysis stacks for the »green« hydrogen production was put into operation in Hamburg. This GigaHub in the Rahlstedt district combines stack development, production, testing and service at a single location. The plan is to achieve an annual plant output with a total electrolysis capacity of more than six GW per year by 2030.**

Particular emphasis was placed on sustainability during construction: Photovoltaic

systems with an output of up to two megawatts were installed on the building and the adjacent parking garage to generate renewable energy. The buildings are heated with district heating, and the waste heat from the testing area is fed back into the heating system. Rainwater cisterns provide irrigation for the green plants, and the parking spaces for cars and bicycles have electric charging points. The hydrogen produced in the testing area is »green« hydrogen and is sold.

We are aiming for Platinum Standard certification for the buildings in 2025. This is the highest quality award issued by the German Sustainable Building Council.

### MAN Energy Solutions opens solar park in Frederikshavn

In June 2024, MAN Energy Solutions inaugurated a new solar park in Frederikshavn (Denmark), which covers an area of 1,190 square meters right next to the company premises on Hjørringvej. The solar park comprises around 500 solar panels, each generating 575 watts and thus making an important contribution to the sustainability of our sites.

»This project enables us to produce our own electricity in an environmentally friendly way and is a significant step towards energy independence,« explained Thomas Leander, Director and Site Manager of MAN Energy Solutions in Frederikshavn. The solar park also supports local biodiversity: The surrounding area has been designed as a natural recreation area with walking trails and seating areas.

»This project enables us to produce our own electricity in an environmentally friendly way and is a significant step towards energy independence.«

**Thomas Leander,**  
Director and Site Manager of MAN Energy Solutions in Frederikshavn



MAN Energy Solutions site Frederikshavn



## Sustainable energy generation at our sites

In addition to reducing energy consumption through efficiency measures, we are also working to further increase the proportion of electricity from renewable sources. Since January 1, 2022, all the electricity we have purchased for all our European production sites has come from renewable sources. At the same time, we are implementing a centrally coordinated program to increase our own electricity generation at our production sites worldwide.

Company photovoltaic systems went into operation in Changzhou (China) in 2022, in Aurangabad (India) in 2023 and in Augsburg (Germany) in 2023. This was followed in 2024 by four further systems with a total generation capacity of almost 1,000 kWp across three production sites in Augsburg (Germany, two systems), Frederikshavn (Denmark) and Zurich (Switzerland).

In 2024, we generated and consumed a total of 1,867 MWh/a at our production sites via photovoltaic systems. This represents a share of 1.6 percent. This means that we are already a quarter of the way to achieving our target of six percent company-generated electricity. A roadmap for achieving the target by building further systems in the coming years has already been developed and agreed. This underlines our commitment to sustainability and demonstrates how green energy solutions can be successfully integrated into operational structures.

### Photovoltaic system installed on test bench roofs in Zurich (Switzerland)

Together with the property owner, we installed a solar system on the building housing our test benches at our Zurich site in 2024. This system is an important component of the energy supply: With its total output of 370 kWp, it covers the entire energy requirements of the test bench with renewable solar energy on sunny days – with the exception of test runs.

A particular challenge in this project was the installation on two green roofs, which are subject to stricter building regulations. The solution is an innovative butterfly arrangement and raised elevation. This allowed us to preserve the green roofs in their natural state.



MAN Energy Solutions site Zurich

### MAN Energy Solutions Kenya installs 10 kWp PV system

This project was part of the VW #1hour project 2023, in which employees developed measures to reduce the ecological footprint: In 2024, the MAN Energy Solutions Kenya service location installed a state-of-the-art 10 kW photovoltaic system on the roof of the administration building of the Triumph power plant in Athi River, Kenya. The power plant is operated by MAN Energy Solutions Kenya under a ten-year Operation & Maintenance contract with Triumph Power Generation. The power station is in standby mode. Until now, the energy required for maintenance was obtained at high cost from the national power grid. The new PV system reduces this dependency and contributes to the site's sustainable energy supply, covering a large part of the electricity requirements of the administration and canteen building. The system will pay for itself after just 4.5 years, so it will bring major financial benefits in the long term. The system is also scalable and can be extended to other buildings.

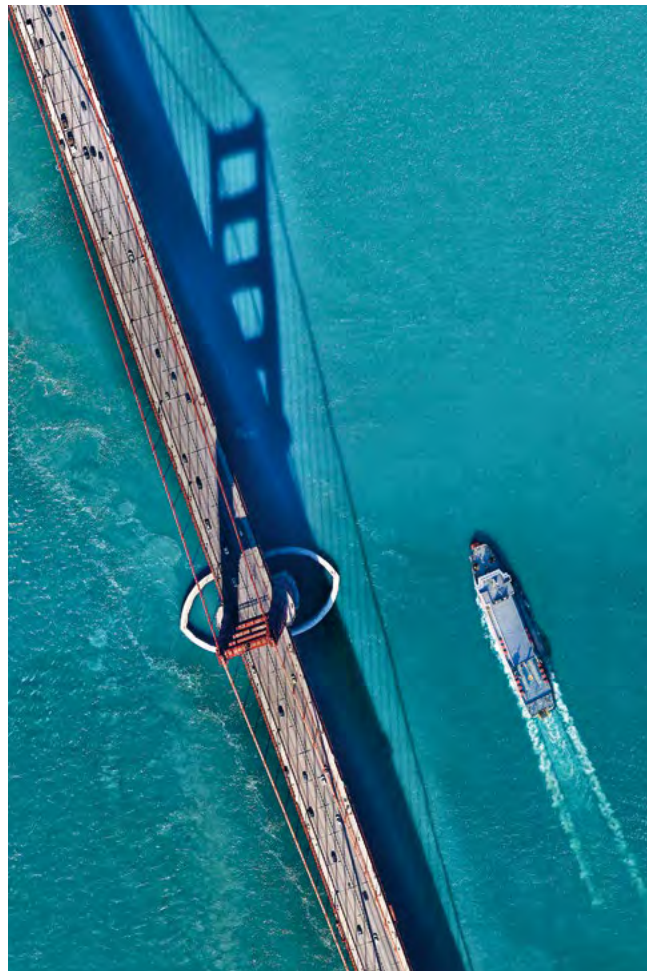


MAN Energy Solutions site Kenya

# Decarbonization of the supply chain

The decarbonization of our supply chain also plays an important role in our company-wide sustainability goals. We currently have around 15,000 active companies supplying us from around 80 countries, mainly European countries as well as those where we have a production site. In general, we aim to keep our supply chain as stable as possible, which is a challenge given current global political developments, the longevity of our products, and the fact that our broad product portfolio causes a certain degree of complexity in the supply chain. For these reasons, suppliers and partner companies play a very important role in our value chain.

In order to meet our extremely important responsibilities regarding human rights and the environment within this extensive external supply chain, MAN Energy Solutions has had comprehensive regulations, processes and audits in place for years, which we constantly adapt to the latest legal frameworks as well as our own expectations and ambitions. Decarbonizing our supply chain also helps us to identify new markets, improve our competitive position and reduce risks.



## Supplier engagement: CO<sub>2</sub> savings in our upstream supply chain (Scope 3)

Our purchasing department also plays an important role in the decarbonization of our company, as greenhouse gas emissions are caused by the production and transport of the products and materials we purchase. To gain more transparency regarding the emissions generated in our upstream supply chain, we took a closer look at these in 2023 and 2024.

The basis for this was an expenditure-based analysis of the goods and services purchased. The calculation and allocation of all monetary purchasing data to specific emission factors was carried out in collaboration with an external service provider (using the so-called spend-based calculation method).

The results of the analysis reflect the fact that the diversity of product groups, materials and supplier companies also represents a high degree of complexity in the calculation of greenhouse gas emissions.

The evaluation showed that certain product groups, materials and suppliers – viewed generically – account for a large proportion of greenhouse gas emissions in the upstream supply chain. The 20 largest emitters from our suppliers cause around 20 percent of the calculated total emissions (Scope 3.1). Half of total emissions are attributable to just

under 100 suppliers, while 80 percent are attributable to well over 400 suppliers.

This illustrates the necessity and relevance of focusing on the largest sources of emissions in our supply chain as a first step. This enables us to identify reduction potential and define suitable measures. To harmonize our ecological ambitions with our economic goals, we are establishing a process to increase transparency in discussions with our suppliers and implement measures in the right places.



### Supplier engagement: introduction of a scorecard to decarbonize our upstream supply chain

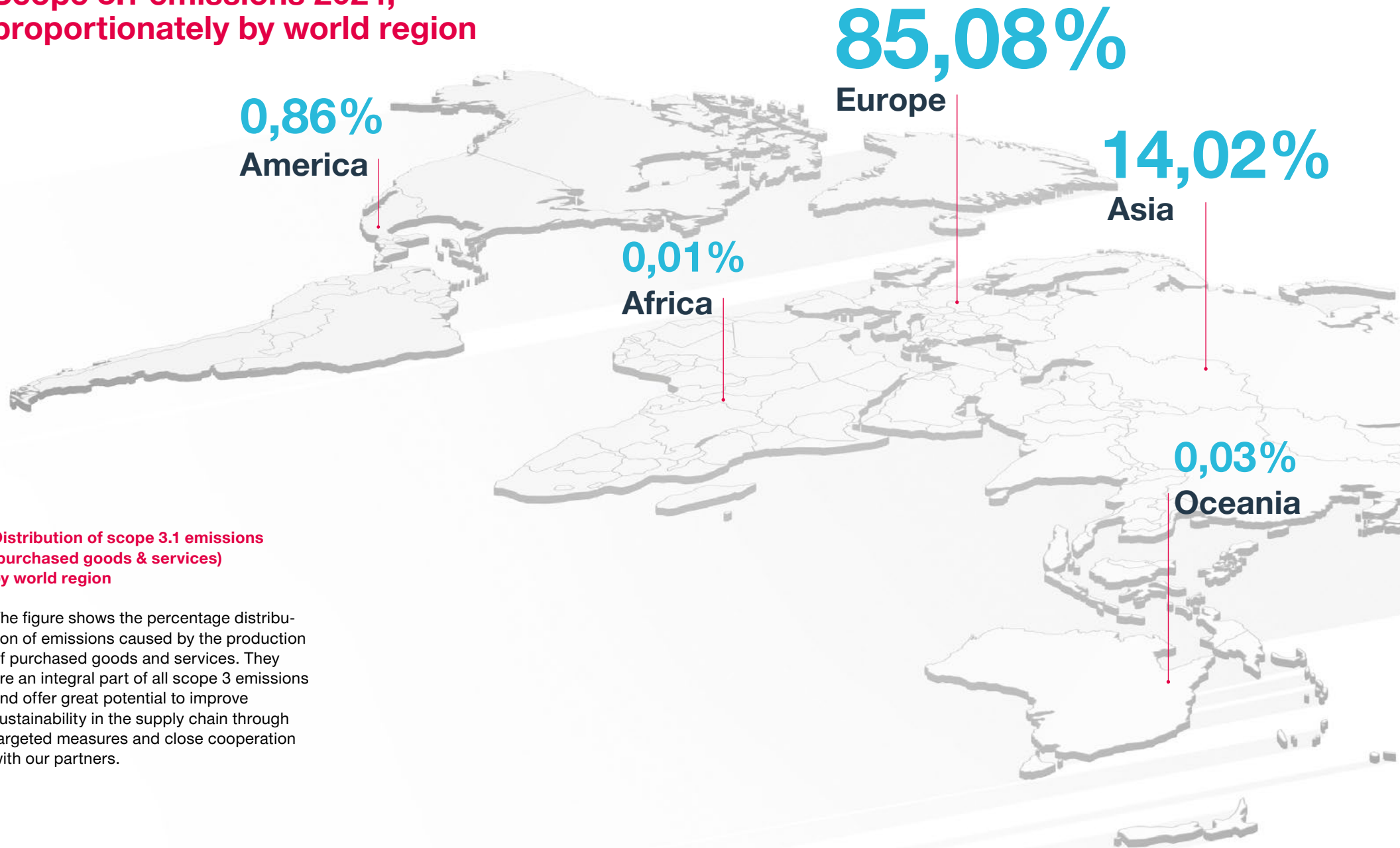
In 2024, the focus was specifically on the »hot spots« in our supply chain, i.e. the 100 suppliers that are responsible for around half of our CO<sub>2</sub> emissions. Our aim here is to further increase transparency, check the plausibility of our calculations, and discuss emission reduction measures in direct contact with supplier companies.

The challenge is that it is difficult to retrieve data, as some of the companies that supply us are not able to provide us with the information we need. This also makes it difficult to define specific activities to reduce emissions.

The next step will therefore be to introduce a scorecard for our TOP 100 suppliers from 2025. This will not only cover the CO<sub>2</sub> aspects, but will also be

used to measure, track and improve the fundamental sustainability performance of these companies across the entire ESG spectrum. To this end, we are gathering information from our suppliers in various ways, for example via publicly accessible data as well as through directly asking the suppliers themselves. The information on environmental, social and corporate ethics aspects is weighted differently in the overall rating. This enables us to evaluate and compare our suppliers with a particular focus on sustainability issues that are relevant to us. In future, these values will also have a greater influence on MAN Energy Solutions procurement's decisions when awarding contracts. By communicating clear goals and expectations, we support and encourage our suppliers to improve their sustainability performance.

## Scope 3.1 emissions 2024, proportionately by world region



### Distribution of scope 3.1 emissions (purchased goods & services) by world region

The figure shows the percentage distribution of emissions caused by the production of purchased goods and services. They are an integral part of all scope 3 emissions and offer great potential to improve sustainability in the supply chain through targeted measures and close cooperation with our partners.

# Resource utilization and circular economy

By »circular economy«, we mean a regenerative system that uses resources and energy efficiently. It aims to use materials and resources for as long as possible and keep them in circulation at the end of their lifecycle, while at the same time minimizing the production of waste. The circular economy thus makes a significant contribution to reducing environmental impacts and achieving sustainable development goals. In addition, a closed-loop system helps to reduce dependence on limited and expensive raw materials and better positions the company to deal with future price fluctuations or supply crises.

The key principles include reuse and recycling. Recovering materials from waste creates added value. Key tools here are operational excellence to increase efficiency in production processes, lean principles to reduce waste and resource consumption, as well as the digitalization of processes for greater transparency and increased efficiency. In addition, standards such as ISO 14001 (environmental management) or ISO 50001 (energy management) require continuous improvement in terms of resource utilization and emissions reduction. These can also be supported by an efficient circular economy.

As a large mechanical engineering company, we have a number of specific opportunities to improve resource utilization and integrate the principles of the circular economy into our activities, as well as a correspondingly large amount of leverage that we can and want to use. This is not only important from an ecological point of view, but also from a competitive strategy perspective.

When it comes to a circular economy, we are active in two key fields of activity: Firstly, we are constantly optimizing our waste and recycling management through initiatives at our own sites and focusing our own production on energy and resource efficiency. This includes, for example, reducing the need for new raw materials wherever possible by reusing materials from our production processes.

Secondly, we conserve resources through our products' long service life, which we achieve through their high quality and technological performance. We also contribute to the circular economy through our measures to extend the service life of our products already on the market through upgrades (using newer product improvements), retrofits (product conversions, for example to more environmentally friendly fuels) and optimal service and maintenance. In most cases, this also goes hand in hand with a significant reduction in CO<sub>2</sub> emissions.



## Initiatives at our own sites

Increasing material and resource efficiency and reducing water consumption at our sites are key aspects of sustainability as well as crucial factors for our economic performance and long-term competitiveness. Preventing waste and using materials in a closed-loop system, for example by recycling or reusing them, offers great leverage here. A concrete example of this is our in-house foundry in Augsburg. Here we manufacture very large components weighing up to 100 metric tons, such as crankcases or cylinder heads. As this is an energy- and raw material-intensive production process, its optimization is particularly important. Around 85 percent of the castings consist of secondary materials such as scrap and recycled chips.



### More environmentally friendly export packaging

At MAN Energy Solutions, we currently still use primary plastics such as PE film and PP packaging for export packaging. By 2026, however, we want to completely dispense with plastic in PrimeServ export packaging or to use packaging with the highest possible proportion of recycled material. The challenge here is to find alternative materials that meet the high requirements for protection and corrosion resistance. The close involvement of packaging suppliers is therefore an important step. Together, we want to develop solutions to gradually establish more environmentally friendly packaging solutions in our warehousing and logistics processes and thus actively contribute to reducing plastic waste. We hope that this will contribute to a more environmentally friendly supply chain. We replaced our usual plastic adhesive tape with paper adhesive tape back in 2024. This alone saves us around 1,000 rolls of plastic adhesive tape a year. The plastic bags in the small parts warehouse are currently being replaced by paper bags. We will soon be testing the possibility of replacing the aluminum composite film with a PE film containing recycled material.

This allows us to keep the use of primary materials to a minimum. Another relevant raw material in the foundry process is sand, which is used as a basic molding material. We use a sand regeneration plant that recycles the sand used so that it can be reused. Over 95 percent of the sand is regenerated. As a result, we only have to purchase a small amount of new sand, thus conserving the natural resources of raw mineral materials.



### MAN Energy Solutions in Changzhou (China) reuses wastewater from washing processes

Previously, wastewater from washing processes at the MAN Energy Solutions site in Changzhou, of which around 150 metric tons are produced each year, was disposed of as hazardous waste by an appropriate service provider. This was also the reason why the Changzhou production site was classified by the Chinese government as a relevant source of hazardous waste.

Until now, it has not been possible to recycle the water because the contents of the wastewater vary greatly depending on the type of washing process: For example, the wastewater may contain various cleaning chemicals or oil. In addition, there was previously no space for a wastewater treatment system.

Nevertheless, the site has found a water treatment solution: Information was first collected from all departments involved in the washing process to obtain an accurate picture of the cleaning agents used and the workpieces to be cleaned. In the next step, the team looked for water treatment systems that would take up as little space



and require as little maintenance as possible. A suitable system was found, purchased and tested in a trial run. An external service provider tested the water quality, and regional environmental authorities were involved in the project to ensure that all equipment and processes complied with legal requirements.

The new system, which was commissioned in October 2024, can treat the hazardous aqueous waste and ensure a freshwater cycle that is as closed as possible for

internal production. This system helps treat 110 metric tons of contaminated water per year. This reduces the amount of waste to be disposed of by almost 100 metric tons per year, leaving around 10 percent liquid waste concentrate for disposal. The successful implementation means that the site is fulfilling its obligation to keep external freshwater requirements as low as possible. In addition, the significant reduction in hazardous waste for disposal greatly reduces disposal costs.



### Exemplary site: MAN Energy Solutions Singapore is committed to decarbonization

In 2024, our site in Singapore achieved multiple successes in terms of the circular economy and decarbonization.

#### Awarded the LowCarbonSG logo

In 2024, MAN Energy Solutions Singapore took an important step towards reducing its own CO<sub>2</sub> emissions to net zero by 2050: MAN Energy Solutions began systematically collecting and analyzing data on the company's CO<sub>2</sub> emissions. The UN Global Compact Network Singapore (GCNS) has verified this data. MAN Energy Solutions Singapore was awarded the prestigious LowCarbonSG logo for its progress in measuring, tracking and reducing CO<sub>2</sub> emissions. This award is presented every year, so MAN Energy Solutions Singapore is required to continue to submit its emissions data to the GCNS for evaluation on an annual basis.

The LowCarbonSG program, led by the UN Global Compact Network Singapore (GCNS) and the Carbon Pricing Leadership Coalition (CPLC) Singapore and supported by various government agencies, helps local companies in Singapore to monitor their CO<sub>2</sub> emissions and implement appropriate reduction measures.

The awarding of the LowCarbonSG logo is a clear signal to the public that MAN Energy Solutions Singapore is committed to actively contributing to decarbonization and taking responsibility for its carbon footprint.



#### Recycling initiative reduces waste and CO<sub>2</sub>

Reducing, reusing and, if necessary, recycling waste can also make a major contribution to reducing our carbon footprint. Even small steps count here. MAN Energy Solutions Singapore has therefore launched a recycling initiative to ensure that waste such as paper, plastic, metal and electronics from the office and workshop areas are properly disposed of or recycled. Unfortunately, this has not always been the case. Over the course of the LowCarbonSG process that MAN Energy Solutions Singapore went through in 2024, in which detailed data on CO<sub>2</sub> emissions was collected, enormous savings potential was identified in the Scope 3 category.

To utilize this leverage, MAN Energy Solutions Singapore introduced various recycling containers in June 2024. In addition, a monthly collection process for recyclable materials was launched and employees were trained to recognize these materials and separate waste correctly. This enabled the workforce to collect 90 kg of recyclable waste between the start of the initiative in June 2024 and the end of the year. To further increase the proportion of recycling, MAN Energy Solutions Singapore has been working with a new waste disposal service provider since November 2024 to support the site in its efforts.

#### MAN Energy Solutions Singapore becomes Solution Partner in the Global Compact Network Singapore's »COOL Solution Ecosystem«

An important step in reaching potential customers who are looking for solutions or technical advice on their path to carbon reduction was the inclusion of MAN Energy Solutions Singapore as a solution partner in the Global Compact Network Singapore (GCNS)'s COOL Solution Ecosystem. This network sees itself as a neutral organization and aims to strengthen collaboration between companies and solution providers. This ensures that no recommendations are made or commissions paid, but potential customers can make completely neutral decisions and approach network members directly. By joining this network, MAN Energy Solutions Singapore is expanding its market coverage, reaching new prospective customers, and supporting other companies on their path to decarbonization.

## Product application initiatives



The long operating life we strive for with our products is also an important aspect of the circular economy. With appropriate design, maintenance and servicing, our systems can achieve a service life of more than 25 years, sometimes up to 50 years. For this reason, the focus during development is on durability and a service concept that allows for easy maintenance and repairability and, in many cases, remolding or retrofiting. We provide our customers with the best possible support in terms of operation as well as maintenance, repair, parts availability and, if necessary, the conversion of our products to more efficient technologies or other fuels to ensure the longest possible operating life with the lowest possible environmental impact. We combine all of these after-sales services under our independent brand MAN PrimeServ. Under this umbrella, there are various areas that are of particular importance for the circular economy: MAN PrimeServ Assist as a digital service solution for our customers, the reconditioning of components, and retrofiting.

**MAN PrimeServ Assist:** We also have a great deal of leverage to improve the circular economy by supporting our customers and our products and solutions in the field. This is where MAN PrimeServ Assist comes in. The basis here is our digital platform CEON, on which product data from the field is analyzed by algorithms. Irregularities in operation are detected quickly and reliably. Our experts, who are organized in a global network and are therefore available to our customers around the clock, proactively evaluate the results and provide recommendations or an action plan. This data-driven approach enables us to increase the availability and overall efficiency of systems in the field, optimize maintenance intervals, and prevent damage requiring intensive repair and resources. In the end, this also helps to ensure a safe working environment for our customers' employees.

In many cases, problems can be solved via remote maintenance. This form of digital collaboration makes a lot of travel unnecessary — which also makes a significant contribution to reducing carbon emissions. In addition, we want to use our digital partnerships to drive innovation and decarbonization in the maritime sector by working with industry players on both a large and small scale.

**Reconditioning:** Another key part of our circular economy efforts is establishing a process for the reusability

of parts. These parts may be bought back so that they do not have to be disposed of or scrapped. We also offer reconditioning, i.e. the overhaul, repair or calibration of old or defective components. Here, our customers receive their own components back as good as new and fully functional. In principle, the costs of remanufacturing a component are significantly lower than manufacturing a new part, and the consumption of resources and the carbon footprint are also reduced compared to the manufacture of a new product.

**Retrofitts or »lifecycle upgrades« (LCU):** Retrofitts or »lifecycle upgrades« (LCU) in particular make a significant contribution to achieving our corporate goals and our overarching mission of »Moving big things to zero«.



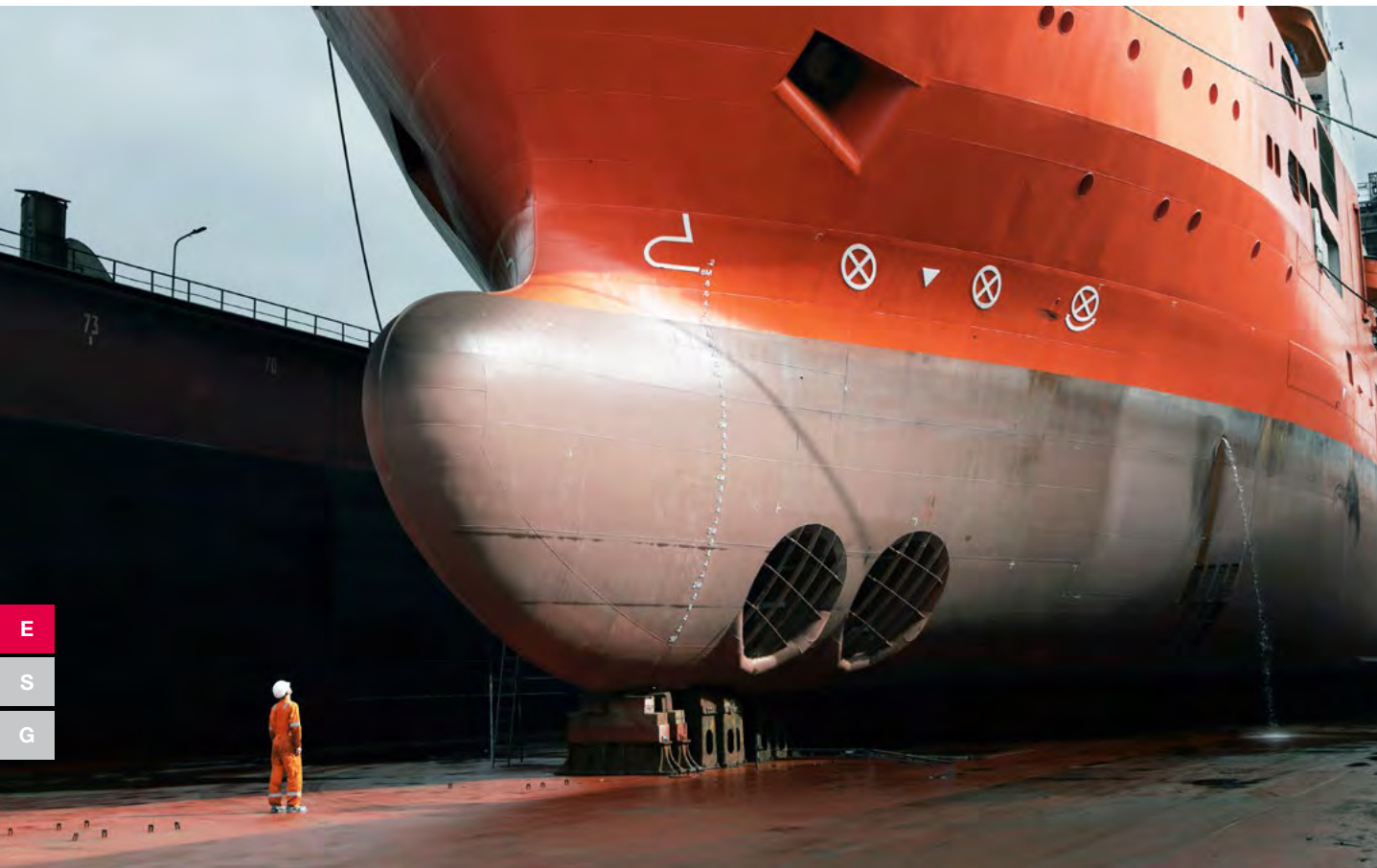
Various regulations and legislative changes are supporting the trend towards converting products and systems already in the field to lower-emission or emission-free fuel variants. One example of this is the EU's »FuelEU Maritime« regulation. It was adopted on July 25, 2023 and is part of the »Fit for 55« package, which aims to enable the EU to reduce its net greenhouse gas emissions by at least 55 percent by 2030 compared to 1990 and achieve climate neutrality by 2050. The EU maritime sector's carbon footprint is to be reduced through the increased use of renewable and low-carbon fuels. In general, the aim is to align the operation of ships with strict carbon emission values so that the entire shipping industry makes an important contribution

to the maritime energy transition and to achieving the 1.5-degree target of the Paris Climate Protection Agreement. Due to the long product service life, this cannot be achieved with new ships alone. This situation has generated strong demand for our retrofits, i.e. the conversion of ship engines in existing fleets, but also of systems in power plants or industrial applications.

There is enormous potential in this business area: Our engines currently provide around half of the global merchant fleet's propulsion power. Around 3,500 of these engines are fully electronically controlled and can be converted to run on alternative, more climate-friendly fuels such as methanol

#### Four new »Lifecycle Upgrade« projects commissioned

A lifecycle upgrade (LCU) is a form of retrofit that gives old engines a new lease of life. An LCU brings considerable economic benefits for operators, first and foremost the significant reduction in carbon emissions. A power plant operator from Spain is now taking advantage of this once again: It has commissioned MAN PrimeServ with an LCU for four engines in three of its power plants in the Canary Islands in 2024. MAN PrimeServ already converted six 18 V engines in 2022 and 2023. The customer was extremely satisfied with the result as well as the project execution and quality, which led to these follow-up projects. Within a few weeks, our colleagues will turn the four 20-year-old 48/60A and B engines into modern 51/60 engines. They replace most of the components — only the cylinder crankcase and crankshaft are retained. The fully renovated engines are prepared for the use of methane or other future fuels and therefore offer the greatest possible flexibility. The engine can also be operated much more efficiently because both fuel and lubricating oil consumption are reduced. The work for this contract will take place in 2025 and 2026.

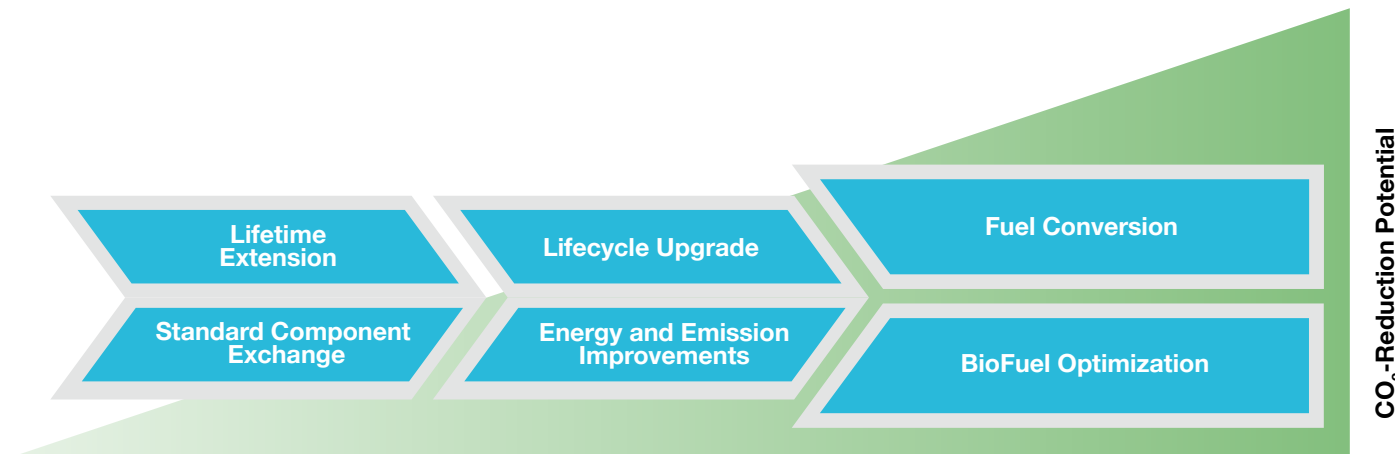


or ammonia. Around two thirds of these ships are eligible for climate-friendly retrofitting. If operated with carbon-neutral fuels over their entire lifecycle, this would lead to a reduction in carbon emissions of up to 86 million metric tons per year.

By 2030, for example, we expect to have completed more than 100 four-stroke engine lifecycle upgrades. Here we offer our customers the opportunity not only to completely overhaul their old engine, but also to upgrade it to the latest engine type. This not only saves the cost of a new purchase, but also reduces carbon emissions by between

5 and 10 percent. If the engines are additionally optimized for operation with biofuels, the effect can be higher depending on the proportion of biofuel. In addition, further retrofits are expected through conversion to alternative fuels, e.g. for synthetic natural gas (SNG) and »green« methanol. A clear roadmap strategy for lifecycle upgrades helps to leverage further potential in the future.

By significantly extending an engine's operating life, retrofits therefore make a significant contribution to an effective circular economy and are also a key driver of the decarbonization of maritime shipping.



**Used components — like new: extended usability through professional reconditioning**

Keeping large components from marine, energy and industrial applications usable for as long as possible: That's the mission of our MAN PrimeServ site in Hamburg (Germany). From gearboxes to windmills, from steam to gas turbines, from engine housings to huge shafts: Our customers can send their used components — regardless of their size — to MAN PrimeServ in Hamburg. There they are professionally overhauled and remolded by our employees.

The workshop works quickly, precisely and flexibly, and the extensive range of machinery enables all types of processing, such as component cleaning, crack testing or welding work. Original dimensions can also be restored. This restores the parts to as-new condition and significantly extends their service life. This not only conserves resources, but also saves our customers the cost of an expensive new purchase.

CO<sub>2</sub>-Reduction Potential

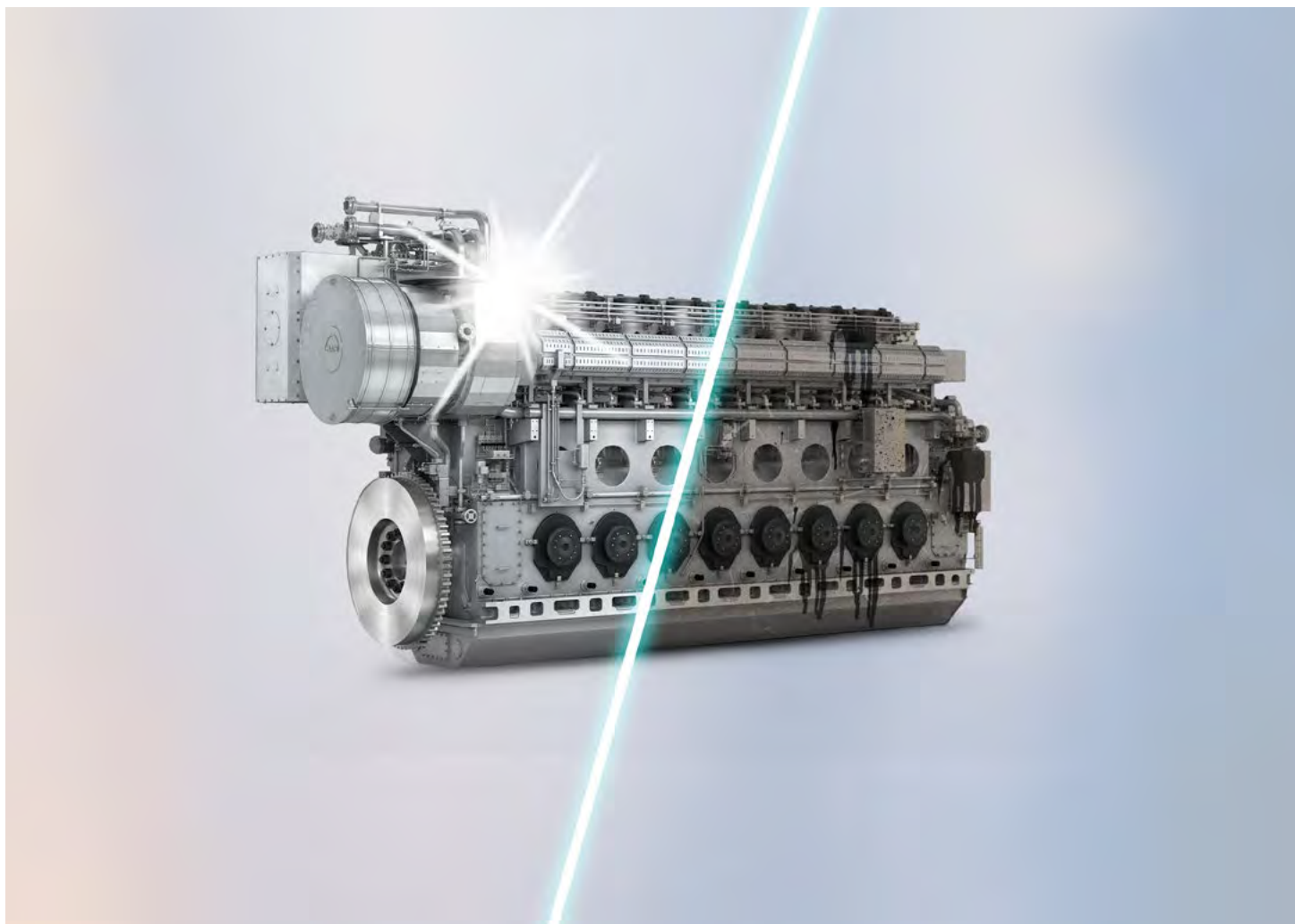
### Pioneering lifecycle upgrade (LCU): roadmap to more environmentally friendly engine use

**Our motors are designed for a very long operating time: Lifetimes of 20 to 50 years and hundreds of thousands of hours are not uncommon. A particular focus here is currently on the 48/60 engines: This model was launched in 1991 and has become one of our most popular products. Many old models are still in operation after 30 years. But that doesn't mean they have to be retired: A lifecycle upgrade (LCU) can breathe new life into them.**

MAN PrimeServ has developed a »ready concept« for converting the »old« 48/60 engines into new, more efficient 51/60 engines, which can thus also be operated with alternative fuels. Various challenges had to be overcome: For example, the 51/60 design, which is constructed for gas operation, had to be approved and further optimized for this class.

Up to ten percent CO<sub>2</sub> reduction can be achieved by converting a 48/60 engine to a 51/60 one, in which around 75 percent of the components are replaced. Since 2021, 14 engine conversions have been carried out. The CO<sub>2</sub> savings from the LCU projects sold to date amount to 213,553 metric tons per year — that's 129,943 VW Golf 7s with a mileage of 11,600 km per year.

A total of 36 such LCU engine conversions have been sold, which is likely to be around 10 percent of the total LCU projects expected over the next ten years: Project manager and LCU initiator Marcel Lodder estimates the total potential at 300 to 400 such projects. This would make it possible to save around two million tons of CO<sub>2</sub> per year. He is convinced that this sector will become even more important in the future: »LCU projects are very easy to tailor to customer expectations. The process is professional and nearly standardized. The LCU projects are increasingly utilizing our production capacity in Augsburg and we



usually also receive a maintenance contract for the converted engines after an LCU. So it's a win-win situation for us and the customer,« he says. Incidentally, MAN Energy Solutions is currently establishing a »Renewable Economy«

concept for components from retrofitted engines to enable the controlled reuse or disposal of old parts on the market as part of a circular component cycle. This also helps to conserve resources and save materials.

# Biodiversity

The United Nations Convention on Biological Diversity defines biodiversity as the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems. In fact, biodiversity is in sharp decline across the world, as numerous studies have shown. The reasons for this include the destruction of habitats, intensive agriculture and climate change. Many species are already extinct, and many more are acutely threatened with extinction.

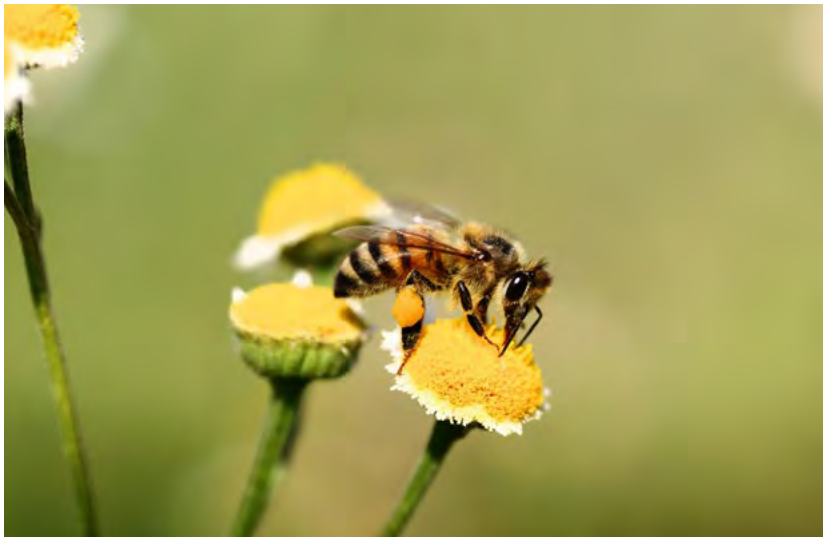
A loss of biodiversity always has far-reaching consequences, because each species performs certain tasks in its ecosystem that keep it in balance – such as insects as pollinators. The protection of biodiversity is therefore of crucial importance to the very basis of our existence. This means that we must all shoulder this great responsibility. MAN Energy Solutions would therefore also like to contribute to the preservation and promotion of biodiversity with various campaigns and initiatives.



## Initiatives at our own sites

Everyone can do something for nature and biodiversity – right on their own doorstep. A healthy ecosystem in our immediate surroundings helps to stabilize the microclimate, maintain soil fertility and regulate the water balance. It also provides natural protection against environmental risks such as flooding, erosion or extreme weather conditions.

To take advantage of these natural positive effects and to raise our employees' awareness of the importance of preserving biodiversity and protecting the environment, we are implementing various campaigns and initiatives at our sites worldwide, such as converting lawns into flowering meadows and sowing wildflowers in barren areas. This creates a habitat for native plants and insects. The commitment of our employees around the world, who are also independently launching various biodiversity initiatives, is particularly noteworthy.





### Taking responsibility locally: supporting environmental protection with reforestation initiatives

At our location in Turkey, the preservation or creation of new habitats and thus the support of biodiversity is an integral part of the agenda: The site makes a monthly donation, depending on sales figures, to the Turkish Foundation for Combating Soil Erosion for reforestation and the protection of natural habitats. The amount of the donation depends on the sales figures; on average, around 100 seedlings are donated each month. In total, almost 1,200 seedlings were planted in different regions of Turkey in 2024. We also communicate this measure to our customers: They receive an electronic certificate for the trees planted. In this way, we not only contribute to environmental protection, but also demonstrate our commitment to a sustainable future to the outside world, which in turn increases the satisfaction of our customers and partner companies. In addition, colleagues from

»It was a small contribution, but it brought a big smile.«

**Damla Biçer Topbaş,**  
QHSE-Manager

MAN Energy Solutions Turkey organized an event on March 21, 2024, the »International Day of Forests«, to raise awareness of the need to preserve habitats, environmental protection and biodiversity. Five colleagues also actively helped to plant trees.

The topic of tree planting also provided the impetus for a small New Year's gesture, achieved by our colleagues in Turkey: All employees and subcontractors at the site received a small olive tree seedling as a small gift at the turn of

the year. A total of 125 olive trees were to be planted in this way — another target set and met. The campaign was very well received: Many employees sent photos of the trees they had planted to the campaign organizers. »It was a small contribution, but it brought a big smile,« says Damla Biçer Topbaş, QHSE Manager.

## Initiatives related to our products

**M**arine biodiversity means the variety of life in the seas and oceans – from microscopic plankton species to large marine mammals and coral reefs. This biodiversity is an integral part of the range of life on Earth. It plays a crucial role in the global ecosystem and has an immense impact on the climate, the economy and human society. Unfortunately, marine ecosystems are severely threatened by pollution, climate change and the effects of maritime shipping and therefore require special protection. MAN Energy Solutions is trying to play an active role here.

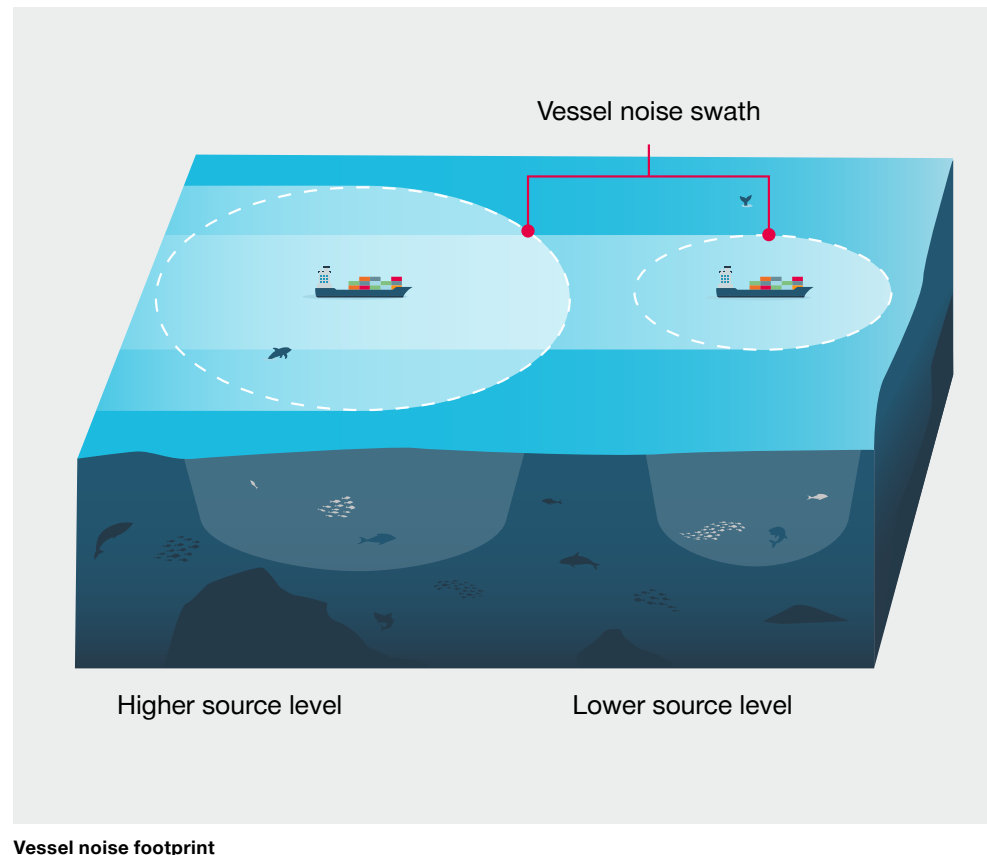
### Protecting marine biodiversity: special propeller design to reduce underwater noise

Shipping has an enormous impact on marine ecosystems: Ships cause underwater noise that can travel long distances. This can impact all animals living in the water, but especially whales and dolphins, which rely on acoustic signals to orient themselves, communicate and hunt. Ship noise disturbs these natural behaviors

and can lead to stress and, in the worst case, even to these marine mammals becoming disorientated and stranded. For this reason, the need to minimize the noise emitted by ships is becoming increasingly clear. The International Maritime Organization (IMO) has also included this issue

in its guidelines, and corresponding requirements will be regulated by classification societies in future. In concrete terms, this means that while conventional propeller designs are primarily designed for efficiency and reliability, the emission of as little noise as possible will be a decisive criterion for new developments. The first step in developing viable solutions requires comprehensive and in-depth knowledge of engine and propeller noise and vibrations.

To achieve this, we have been using state-of-the-art CFD simulations (computational fluid dynamics, i.e. the computer-aided numerical method for analyzing and predicting flow behavior and phenomena in liquids) in the design phase of our propulsion systems since 2005 in order to analyze flow phenomena and noise emissions under water. Together with the classification society DNV, large-scale experimental measurements on a full-scale ship are planned for spring 2025 to verify the numerical model calculations. MAN Energy Solutions is thus assuming responsibility for the maritime ecosystem and positioning itself as an innovative and reliable system provider of low-noise drives in the industry.



Vessel noise footprint



# People & Society

## Our motivation

We are convinced that economic success and social responsibility are inextricably linked. This includes our employees as well as everyone in our business environment.

## Our ambition

We strive to be an employer of choice that promotes diversity, equality and inclusion and ensures employee health and safety.

We are committed to responsibility in the supply chain and strive to make a positive impact on society.

## Our goals

We want to increase the proportion of women in management to over 16.4 percent by 2030.

**Women in management:**  
≥ 16.4 percent | 2030

We want to reduce the Recordable Injury Frequency (RIF)<sup>1</sup> value to below five at all production sites by 2030.

**Recordable injury frequency:**  
≤ 5 | 2030

<sup>1</sup> The RIF value shows the number of work-related accidents in relation to hours worked, based on 1 million hours worked.

## Alignment and strategy

With our growth program and MAN Energy Solutions' positioning as a provider of more climate-friendly energy solutions, people and society have an important role to play. The well-being of our employees and society matters to us in general, because we see our economic success as being inextricably linked to it.

Our understanding of this is very broad and we express it through further developing our safety culture and promoting the health of our employees, as well as systematically qualifying and educating everyone who works at MAN Energy Solutions. We take responsibility for ensuring compliance with human rights for the employees in the companies along our supply chain. We want to make a positive contribution to society by supporting projects and initiatives outside our company. An important goal is to promote diversity,

equality and inclusion. One of the main focuses relating to this goal in 2024 was the recruitment of women in order to significantly increase the proportion of women in the workforce. We want to use diversity as an opportunity in general and continue to establish a culture of diversity and acceptance. We have defined goals at all organizational levels for this purpose. In taking all these measures, we want to strengthen the image of MAN Energy Solutions as an inclusive, responsible employer and make our company attractive to applicants.

## Our People Strategy

Over the course of the company's transformation and the associated realignment of HR, we developed the People Strategy in 2023 and 2024. The strategy was devised in the HR departments at international level as part of several workshops.



### Attract to join:

We attract people with the right skills, attitude and enthusiasm from around the world. We create a modern, versatile working environment that sets us apart from the standard.



### Engage to lead:

We empower our employees by providing them with adequate development opportunities. This gives them the chance to improve their skills and knowledge, develop themselves, seize opportunities and pursue their individual career goals.



### Empower to grow:

We are drivers of a contemporary leadership culture. We want to support our managers by providing them with the necessary framework, principles, values and tools for modern employee management.



### Open for change:

We foster an attitude open to improvement, transformation and innovation. We help employees have a positive outlook regarding change and innovation, and encourage their willingness to learn and implement new ideas and methods.



### Attract to belong:

We offer an excellent working environment — our employees feel that they belong and enjoy working with us. The focus is on employees, and their satisfaction and well-being.

These five strategic objectives have been broken down into corresponding operational objectives for each of HR's subdivisions (Governance & Strategy, Center of Competence, Business Function and Business Function International, Excellence Center and Talent Acquisition) and linked up with various concrete actions in order to achieve these objectives. Examples can be found on the following pages.

## New HR »People Profile«

**M**AN Energy Solutions presented the new HR »People Profile« in 2024 as an important value base for cooperation within the company and the core competencies its employees require for this. This step was made necessary by the company's new strategic direction and resulting changes. The aim of the People Profile is to provide guidance and establish a common

understanding of the necessary mindset and core competencies among all employees.

The People Profile covers the five areas of teamwork, responsibility, passion, curiosity and foresight and assigns two key requirements that need to be strengthened and promoted to each area.

The People Profile now forms the basis for many of our HR tools for staff selection and development, such as internal and external selection procedures, employer branding and certain employee appraisals, and is used as a feedback tool. Other staff tools are currently being gradually examined and adapted to the new requirements profile.

## People Profile

Our values, our mindset, our skills.



**Achieving more together**  
We are a team.

### Team

**Leading teams to success**  
We strengthen our teams.



**Setting an example of integrity and compliance**  
We do the right thing for our company.

### Responsibility

**Sustainable entrepreneurial mindset**  
We act as if it were our own company.



**Inspire customers**  
We create WOW moments.

### Passion

**Living our passion**  
We are proud of what we do.



**Personal growth**  
We grow with challenges.

### Curiosity

**Being a pioneer**  
We think in new ways and move forward boldly.



**Dealing with complexity**  
We find appropriate solutions.

### Foresight

**Shaping with foresight**  
We discover and harness future potential.



The People Profile serves as a guide and framework for future HR tools in recruitment and employee development.

# Our people



For our new growth strategy, it is essential to give our employees targeted, future-oriented training. They are the foundation of our success, and each team member, regardless of their position, can contribute to realizing our vision of a sustainable future.

For this reason, giving our employees continuous development and training and helping them to be motivated and identify with their work and MAN Energy Solutions as an employer are central parts of our company identity. That's why we specifically invest in comprehensive training and development programs, creating an environment where learning and growth are part of everyday work, knowledge and experience are shared and everyone has the opportunity to reach their full potential.

We provide continuous learning, modern training formats and individual offers that meet the different needs and ambitions of our employees. This includes, for example, development and qualification opportunities, special young talent and career programs, mentoring or rewards for ideas that make improvements and contribute to the company's success. One of our focuses is on promoting digital skills and using innovative learning methods.

### MAN Energy Solutions Turkey awarded the »Great Place To Work« certificate

Measuring, improving and making employee satisfaction visible to the public — this is what the »Great Place To Work« certification process is all about. Our site in Turkey successfully went through this process in 2024 and is now officially a »Great Place To Work«.

The certificate is awarded based on a representative and confidential survey which involves employees rating 60 statements on the 5 aspects of credibility, respect, fairness, pride and team spirit. If certain values are achieved, the company then receives the »Great Place To Work« certificate.

Managing Director Timur Iyi is delighted with the award and points out: »A good workplace culture is a process shaped by employee experiences, an understanding of the local culture and how company management behaves, all of which have a significant impact on the working environment. A workplace culture based on high trust leads to a better performance. Therefore, obtaining this certificate is only the first step. We have much more to do for our company, hand in hand with our employees. This is motivating and strengthens our belief in a bright future.«

According to Timur Iyi, hierarchies take a back seat to the belief that each and every one plays an important individual role within the company and has a special responsibility within the organization: »This makes each and every one an indispensable part of the company,« he emphasizes. »We want to share with everyone that MAN Energy Solutions Turkiye has achieved this great success thanks to the dedication, commitment and contribution of all our employees.«

### Training at the highest level: the best trainees honored



**Providing training to young professionals has made an important contribution to meeting the demand for skilled workers at MAN Energy Solutions for years now. This is why we attach great importance to high-quality training and are proven to provide excellent education at our sites, as demonstrated by the awards MAN Energy Solutions is able to keep giving out to its trainees.**

Andreas Eder, structural mechanic for steel and metal construction at the Deggendorf site, came top in the country in 2024, with Peter Jakob, Technical Product Designer on a cooperative degree program in Augsburg, coming top in the state. The winners are determined by the Chamber of Industry and Commerce according to their

»We are proud of these great achievements and are very pleased to have such colleagues on board.«

**Jörg Widemann,**  
Head of Training in Augsburg

grade point average. The best trainees from our sites in Germany and Switzerland were personally honored by Ingrid Rieken, Chief Human Resources Officer, as part of the 2nd training event held in Augsburg on 14 and 15 October 2024: Timothée Demon (polymechanic, Zurich), Cedric Elsener (designer, Zurich), Peter Jakob (technical product designer, Augsburg), Kevin Sauertz (machinist, Berlin), Alexander Schmidt (industrial mechanic, Oberhausen) and Andreas Eder (construction mechanic, Deggendorf) all completed their training at MAN Energy Solutions with outstanding results. »We are proud of these great achievements and are very pleased to have such colleagues on board,« says Jörg Widemann, Head of Training in Augsburg and host of the event. »In addition to congratulating the award winners, our congratulations and thanks also go to all the instructors and departments. Because without their great work, such outstanding results would not be possible.«



### Training at the highest level: renovation of the machining workshop creates an optimal learning environment

**In order to ensure that our training is high in quality and that MAN Energy Solutions remains attractive as a training company, the environment and learning conditions for budding skilled workers must always be state-of-the-art. MAN Energy Solutions has made sure of this through the extensive renovations carried out on the machining workshop.**

With a total cost of 4.4 million euros, the project was one of the largest investment projects in the history of the MAN Energy Solutions training center in Augsburg (Germany): Ground, lighting and electrical systems were renewed and 36 state-of-the-art lathes and milling machines were purchased. And training did not stop as the renovations were taking place, which was certainly a challenge.

On July 9, 2024, the new workshop opened its doors to the Executive Board, company employees, guests of honor and members of the Training Advisory Board of our partner company RENK. The verdict was unanimous: The state-of-the-art training facility is a win-win for companies and trainees alike, and the renovated training center with its brand-new lathes and milling machines now ensures state-of-the-art learning. Dr. Uwe Lauber emphasized how important this is for young people, as well as for the company, in his speech on opening day: »We need skilled young people in our company and this is why the Board has always agreed on the fact that investing in training is also an investment in our own future.«

### Understanding the corporate strategy: learning on Greenovation Island

In order for every employee to be capable of explaining to customers and partners how our key technologies work and how our company can provide support on the journey to a more climate-friendly future with its strategy of »Moving big things to zero«, the HR Development division developed a multi-part training series in 2024, together with over 30 experts from across the company. As part of six web-based modules, important knowledge is shared and made understandable. The training courses answer questions such as: How can we contribute to the decarbonization of key industries in the global economy with our strategy and new focus technologies? What ambitions and goals are we pursuing at MAN Energy Solutions? What are the technological challenges in the fight against climate change? The training courses are complemented with concrete projects from practice, where the technologies presented are already being put to use.

The training modules were made available in four languages throughout the company and by the end of 2024, had been completed by a total of around 2,600 employees. Feedback was consistently positive: The participants especially praised how complex topics were clearly presented and how easy the modules were to use.



### Shaping transformation: »Future Makers« initiative at the Zurich site

Anyone at MAN Energy Solutions in Zurich (Switzerland) who has ideas on how to redesign or improve working methods should not keep them to themselves, as they have a very good chance of becoming a reality: The initiative »Future Makers« expressly encourages employees to question the status quo within their area, as well as across departments, to try out new work formats and to implement changes independently.

Since the launch five years ago, numerous self-organized communities have been formed, consisting of employees from various departments and hierarchical levels who voluntarily dedicate themselves to future-oriented topics.

An example where projects are first presented at department level shows how this freedom can be meaningfully exercised. Instead of projects being assigned to employees, they are advertised on an online platform. Colleagues then come forward for their favorite based on their interests and strengths.

This and other projects help employees take direct responsibility, network and have the courage to try new things. As such, structures, working methods and thinking are all being further developed at our Zurich site.



### Digital training: launch of the LinkedIn Learning platform

**MAN Energy Solutions has been using the new LinkedIn Learning platform across the globe since December 2024 as a new approach to training. It complements existing training with flexible, highly scalable options that are available to anyone who's interested.**

The modular structure and personalized course recommendations address the varying individual needs of the workforce, enabling employees to organize their learning themselves through digital aids and take on a more active, self-determined role.

There are several factors that have made this addition necessary: As part of the company's »Moving big things to zero« strategy, it is essential to qualify employees for new technology and business areas. The half-life of knowledge is getting shorter and shorter, making more intensive training necessary, and there should also be more flexibility on offer in terms of time.

LinkedIn Learning opens up an enormous range of training opportunities: The platform offers over 24,000 video and audio courses in areas such as digitalization, artificial intelligence, office software, personal skills and leadership.

Since December, the new learning platform has been available to all employees, around



the world and around the clock. The licenses are procured centrally by HR and increased as needed.

Employees can find all information about the new learning platform on the intranet, and there is a comprehensive support concept in place too. A Teams channel and weekly coffee talks promote exchange and interaction between learners and managers.

For the German sites, a new general company agreement for »Online Learning« was adopted, anchoring job-related learning in working hours and thus illustrating the high priority given to employees' continuous development. LinkedIn Learning is also available in full to all employees for use in their spare time for their private further education — saving employees the fees for a private license.

All of this shows that MAN Energy Solutions is focusing on a digital and thus extremely future-oriented learning strategy that takes in-house training to the next level.

# Health and safety



We see occupational health and safety as an essential part of our corporate culture and responsibility. In doing so, we follow the principle of safety first and do our best to ensure health and safety with measures to prevent accidents at work and occupational health and safety arrangements within the framework of national regulations and on the basis of our company's health and safety policy.

In concrete terms, this means that we support employees in fulfilling their responsibilities when it comes to occupational health and safety, enable them to gain professional qualifications and actively involve them in the implementation of requirements. We promote preventive measures for improvement to provide safe and healthy working conditions for our employees and service providers. Based on best practices, knowledge obtained

from unsafe situations, near misses and accidents, we have gained valuable insights and are continuously working to improve our safety. We also have incentives to promote safe behavior. In this way, we are continuously developing our occupational health and safety management system, including the related compliance aspects.

Our occupational safety efforts are accompanied by a wide range of workplace health promotion programs. Our measures range from health checks to initiatives involving physical activity and nutrition, through to programs on stress management and work-life balance. We pay particular attention to prevention: Through targeted training, information campaigns and proactive company health management, we want to help ensure that everyone at MAN Energy Solutions remains fit and healthy in the long term.

### International HSE Conference 2024 in Augsburg: further increasing awareness of occupational safety

**From 9 to 11 April 2024, our international Health, Safety and Environment (HSE) conference took place at the MAN Museum in Augsburg. Thirty-five colleagues came from China, India, Portugal, Great Britain, Denmark, Turkey and the various German sites to jointly develop the strategy for health, safety and the environment at MAN Energy Solutions.**

The program included lectures and workshops on topics such as safety in production operations, data protection, hazardous materials management and environmental protection. The main components of the conference were the discussion panels, in which board members Ingrid Rieken and Martin Oetjen also participated. They addressed the question of how to better link HSE management and operational management and how to address

HSE matters more emphatically across all hierarchies. Everyone present worked together very openly and committedly, making suggestions and partaking in lively discussions. There was a particular focus on occupational health and safety. In order to achieve our ambitious target of an RIF value\* of less than 5 at all our production sites by 2030, we need to raise awareness of the issue even more than before among managers, who are in an important role

model position, and all employees. To this end, four concrete measures have been adopted, which will be implemented from 2025 onwards:

1. What are known as »Safety Moments« are mandatory at any meeting of ten or more people. This involves a briefing on the topic of occupational safety to open the meeting.
2. Employees are given more motivation to use the handrail in the stairwell with personal information and visual cues.
3. Managers should visit production areas at least twice a year and familiarize themselves with potential danger areas there in person, and in conversation with employees.
4. A stricter obligation to wear safety footwear in the production area will be introduced – even for employees who are only there briefly or on the sidelines. This will first be done at the plant in Augsburg.

These efforts will help us to sharpen our focus on the topic of occupational safety around the globe and to anchor it even more firmly than before in our entire corporate culture.

\* The RIF value shows the number of work-related accidents in relation to hours worked, based on 1 million hours worked.





### Safety nuggets raise awareness of occupational safety in Denmark

At MAN Energy Solutions, employees are sometimes employed in very high-risk areas — for example, they work in production with sharp tools and hot substances or disembark or board ships on the high seas. The variety of activities and hazardous situations makes ensuring comprehensive occupational safety a complex challenge. This makes it all the more important to develop a proactive safety culture and define the role managers play in the context of health and safety. As Charlotte Skovmand, HSE Manager for Denmark, recognized, many risks and hazardous situations

arise because employees assume that safety inspections are carried out only superficially.

MAN Energy Solutions Denmark therefore developed a special format in 2024: Safety nuggets are 15- to 20-minute virtual meetings for middle management that are recorded as mandatory training courses so that they can be viewed at any time afterwards. In this way, an effective HSE management system will be established to identify and raise awareness of potential hazards so as to promote a proactive safety culture.



### The healthy shift work project: support for shift workers

Working shifts poses physical and mental challenges for employees. Changing sleeping and eating times not only affect well-being, but family and social life too. In addition, there are stresses and strains such as standing for a long time, noise and unfavorable posture. In order to better overcome the challenges posed here and pay more attention to health in everyday working life, the Health Management Working Group, together with the BARMER health insurance fund, launched the half-day seminar called »Gesunde Schicht« (Healthy Shift Work) at the MAN Energy Solutions site in Augsburg in November 2024. It is aimed at shift workers in

production and covers topics such as ergonomics, stress management, nutrition and sleep. Specialist speakers teach the theoretical basics and share practical exercises that can be easily integrated into everyday life. The event is held at the museum in Augsburg, in a small group of only 15 participants in a relaxed setting. The event is rounded off with lunchtime catering including healthy dishes that can be easily re-created. The feedback from the more than 200 participants was consistently positive. For 2025, 20 »Healthy Shift« seminars are scheduled to take place — also at additional MAN Energy Solutions locations throughout Germany.

**Occupational healthcare especially for women:  
»Frauengesundheit er#leben« (Experiencing women's  
health) project wins HR Excellence Award 2024**

**MAN Energy Solutions has been working on the »Frauengesundheit er#leben« project in collaboration with the BARMER health insurance fund since 2024.**

Some 50 female employees of MAN Energy Solutions Augsburg have participated. The reasons why we have dedicated ourselves to this topic are manifold: For example, high numbers of women suffer from numerous diseases and symptoms, but they are often undertreated. They often suffer from high levels of mental stress due to the double burden of work and family, and caring for relatives, leading to an increased risk of sleeping problems, depression and anxiety disorders. In addition, women are often perceived as less affected and therefore receive lower doses of painkillers and other medication. Studies show that women reduce their working hours, refuse promotions and retire earlier due to menopause.

For many of these gender-specific complaints, the Frauengesundheit er#leben initiative provides effective help so women can help themselves, in the form of knowledge sharing, physical exercises or mental support. This can reduce stress and strengthen resources.

It was precisely these topics that were addressed in Frauengesundheit er#leben: As part of the program, participants



**Award Ceremony HR Excellence Awards 2024**

discovered crucial motives relating to health and the influence they have on their own personal well-being. They also learned skills so they can actively influence their health. This knowledge enables them to reduce mental stress and positively transform the subjective perception.

The women's subjective individual states of health were recorded via pre- and post-surveys and their objective condition via measurements of vital, activity and recovery parameters using the innovative screening belt. There were workshops and online lectures on topics specific to women, such as hormonal nutrition.

The seminar showed the women that self-regulation is possible on a mental and physical level, thus exploring a new approach to their own health literacy. The participants reported that their mental and physical well-being improved significantly as a result of the workshop. But the company also benefited from this pilot project, as it was able to develop a deeper understanding of the individual needs and challenges of its female employees.

The jury of the HR Excellence Awards 2024 also acknowledged the innovative power and potential of the pilot project: It came first in the »Well-being and Occupational Health Management« category.

### Fresh energy for our social counselling: services standardized and expanded

**MAN Energy Solutions is committed to providing employees with high-quality, comprehensive social counselling in the event of mental stress — regardless of whether this stress is related to your work or private life.**

Until now, the options for social counselling services offered at MAN Energy Solutions' German sites have varied: While in-house counselling has long been available in Augsburg, for example, only digital or telephone support has been possible for employees at other sites. Some sites already had an Employee Assistance Program (EAP).

The aim was to standardize company social counselling to the effect that all sites offer the range of services of an EAP service provider and also to extend this offer so that it is the same for all sites. This also includes the possibility of face-to-face consultations within a maximum radius of 30 km from the plant for all German sites.

In order to achieve this, the HR Excellence Center DE&CH first analyzed the options for in-house social counselling that are standard in the industry, defined benchmarks and created a list of requirements in the summer of 2024. There was then a nationwide call for tenders to search for a social counselling service provider. This provider was determined in the 1st quarter of 2025 and they will begin their work in Germany in the 2nd quarter of 2025, so that in the future, all employees will have access to comprehensive social counselling regardless of their location.

The overarching goal of this measure is to promote employee mental stability and health and thus help them maintain their motivation and ability to work. What's more, the offer is intended to help employees identify more with the company and strengthen their loyalty, as well as to make MAN Energy Solutions more attractive as an employer.



### Back to work — better supported: reintegration management redefined

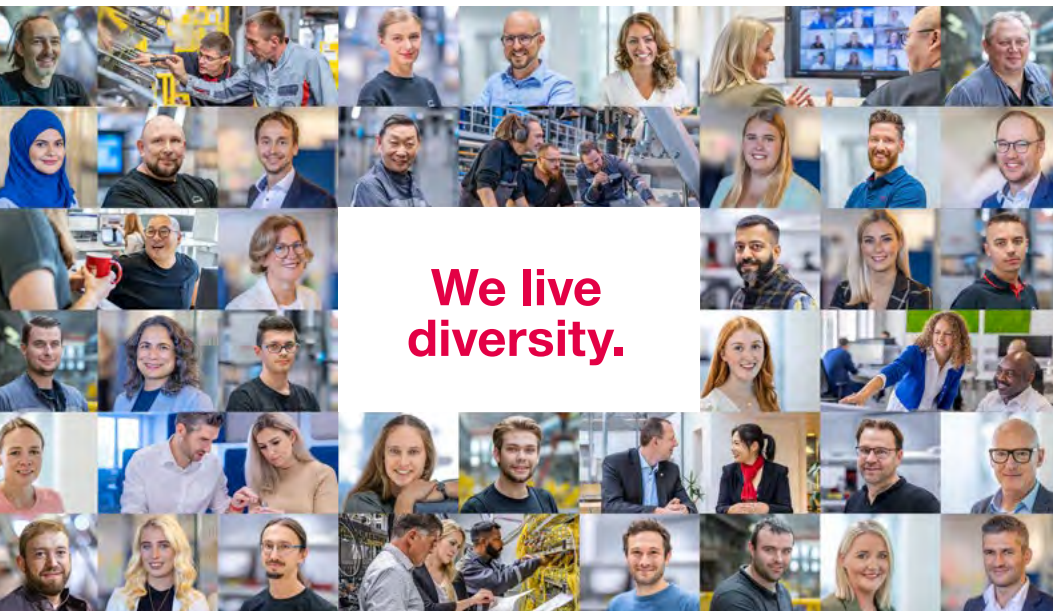
**Reintegration after prolonged absence due to illness is required by law in Germany and there are certain requirements for this process that are also clearly regulated.**

In order to make employees' return to work as efficient and effective as possible for all parties involved above and beyond the fulfilment of these obligations, MAN Energy Solutions redesigned its reintegration management process in 2024. This new process is currently being established at all German sites.

To this end, as part of the first step in 2024, the different approaches at the different sites were recorded and analyzed, and other companies' reintegration models were looked at in order to learn from them. In various workshops, site managers developed a new approach that precisely defines the individual steps involved in reintegration and the people that have to be or can be involved in each case. The new process was adopted in a general company agreement.



# Diversity and inclusion



It is proven that diverse teams achieve the best results. Each team member makes a valuable contribution to this through their individual skills and life experiences, and the different perspectives and approaches promote innovative solutions. We want to use this potential and create an environment in which all employees, regardless of origin, gender, age, sexual orientation, skills or beliefs, can fully develop their potential and be respectful of each other. Our goal is to break down barriers, promote mutual understanding and intercultural exchange, and create a working environment where every voice is heard and everyone has equal opportunities.

We see diversity and inclusion not only as a driver for great results, but also as our corporate responsibility and social mission: By creating jobs for people from a wide variety of backgrounds and abilities, we can contribute to social justice and economic participation. Last but not least, fostering an inclusive corporate culture in times where skilled workers are scarce is also a clear competitive advantage when it comes to recruiting skilled workers.

**We live and breathe diversity** in terms of age, cultural background, gender, and sexual orientation, and actively promote inclusion.

**Diversity** in mindsets, skills and experiences enables creativity, innovation and dynamism.

**We create an environment** that helps everyone to be their individual selves in the company's interests.





### MAN Energy Solutions Denmark promotes diversity and inclusion with the Diversity Annual Wheel

In order to promote connection among employees and their understanding of each other, MAN Energy Solutions has implemented a variety of different measures, both nationally and internationally. A particularly nice example comes from Denmark: MAN Energy Solutions Denmark has been running the Diversity Annual Wheel since 2023, highlighting holidays that are celebrated around the world. The initiative aims to promote diversity and inclusion, share knowledge and strengthen the connection between the more than 2,400 staff members from more than 52 nations employed at the Danish sites.

On the relevant holidays, various measures are taken to raise awareness of the associated traditions: Information is displayed on screens in the offices and employees are invited to organize events. HR Recruitment Partner Raheel Chauhan seized this opportunity in March 2024 and organized a large Ramadan dinner to which the entire workforce was invited. Around 100 colleagues came to the traditional break of fasting and enjoyed an evening of fine dining, intercultural exchange and a supporting program that included traditional performances as well as a panel discussion on inclusion in the labor market.



### A celebration of community: Employees and families experience a special day at the Bangalore site

On March 30, 2024, family day took place for the employees at our site in Bangalore (India), a magical occasion for the 500 or so guests that attended. They had the unusual opportunity to look behind the scenes at MAN Energy Solutions and experience their loved ones' working environment up close. The day opened with a traditional Indian light ritual and also included an exhibition of the works of young artists from among the staff and a tribute to the employees who celebrated their 20th anniversary. Special highlights included performances by the employees and their family members: Everyone was able to make their contribution here and show off their talents – such as singing, dancing and performing. Many children also participated in the action and dared to take to the stage. At the end of the day there was a dinner and relaxed gathering under a starry sky. Feedback was entirely positive: The guests praised the program with all of its details, as well as the sense of belonging generated and the vibrant, inclusive workplace culture that was clear to see at the Family Day.



## WoMAN — Empowered women. Empowered future.



**E**mpowering and advancing women is an important concern for MAN Energy Solutions at all sites across the globe. The company wants to empower women with their ideas, expertise and perspectives, offering them opportunities for development and fully exploiting their potential — for the benefit of both employees and the company. Because women make a significant contribution to the future viability of MAN Energy Solutions, and not only against the backdrop of the skilled worker shortage.

In 2024, there were various actions, offers and projects in place around the world to present the traditionally male-dominated company as an attractive employer for women, or to empower women in the workforce. According to a study, only about 16 percent of female employees in Germany are working in science, technology, engineering and mathematics — a number that MAN Energy Solutions believes urgently needs to change. This is why the company has set themselves a clear goal to recruit significantly more women.

### Future Week and Rocketeer in Augsburg: MAN Energy Solutions focuses on women

At the end of April 2024, Future Week took place in Augsburg, a national event focusing on innovation, digitalization, future technology, business, research and society. Numerous companies participated and held events, discussions, panels and lectures, including MAN Energy Solutions. The objective was not only to provide information on our strategy shift towards becoming a solution provider for decarbonization, but also to address women as potential employees – and thus send a clear message, not least as the largest tech company in the Augsburg region.

For example, the empowerment networking event »Women in Tech« held by MAN Energy Solutions as part of Future Week was specifically aimed at women who are active in technical professions or interested in such a career. The event was devised and

run exclusively by women. The program included a personal welcome from Ingrid Rieken as the first female board member in the company's history, a factory tour and a business lunch at the PrimeServ Academy. In addition, the participants had enough time to get to know each other, exchange experiences and make contacts.

The Rocketeer Festival, a major conference for digital innovation and future trends, also took place as part of Future Week. Here, too, our company, who also supported the event as a sponsor, focused entirely on the topic of »women in technical professions«: MAN Energy Solutions initiated the panel talk »Women in Tech« and a technical lecture on »Green engines – Sustainable maritime shipping« was given by Petra Rektorik, development engineer for sustainable fuels at MAN Energy Solutions. We also had an all-women stand. They introduced the corporate strategy to all interested parties and presented MAN Energy Solutions as an employer in general, and especially for women.





### »Women in Tech« worldwide campaign

The proportion of females at MAN Energy Solutions is still almost 17 percent, while the proportion of females in management is 10.4 percent. But that is about to change: MAN Energy Solutions is committed to bringing more women into technical jobs and significantly increasing the proportion of females in the workplace. An international employer branding campaign entitled »Women in Tech« is set to make a significant contribution to this. The goal: to present MAN Energy Solutions as an attractive employer for women and as a diverse, inclusive company, and thus attract women to work at MAN Energy Solutions — and ultimately further increase diversity within the company. The campaign started in November 2024 and will run until the end of 2025. The motifs each combine an attention-grabbing image with a powerful statement, such as »We drive female empowerment. With up to 82 megawatts.«

»Our campaign aims to break stereotypes and challenge norms,« says Karin Römer, Employer Branding Manager for Group Communications & Marketing. Her colleague in employer branding, Isabel Schmid, adds: »It's also about being bold and demonstrating that our company wants to harness the creative and innovative potential of women in all areas, especially technical, more than before.« The motifs are digitally displayed on Google formats (including YouTube, YouTube Shorts and Gmail) as well as on META and LinkedIn. Posts will also be made on all MAN Energy Solutions social media channels to accompany the campaign — please share. If you're a woman and this information made you curious, please visit the redesigned [website](#) to find out more.

### Breaking down traditional role models: women in production

Many job positions at MAN Energy Solutions are very male dominated — especially in production. Women managers are still underrepresented here. Fortunately, the industry, and especially the production environment, is currently experiencing a change and this is also changing the perception of gender roles. Here at MAN Energy Solutions, we are also working to break down outdated role models and counter traditional stereotypes.

Three young female machinists from Oberhausen shared their experiences as women in production in a special issue of our employee magazine MAN People, entitled »WoMAN«. The three are agreed: Production often requires »mind over matter«. For example, they use tools such as cranes to safely move heavy loads, and so they are a match to their male counterparts. According to Jule Möltgen, there are hardly any significant differences between the sexes: »Expectations are the same for everyone, and male and female colleagues complement each other well, which is particularly important for shift work.« Her colleague Larissa Lieven points out that, despite there being a dominant male presence in managerial positions, a female view can be beneficial. She uses the roles of technical trainer or overseer as examples of women's capabilities in all areas — something the company also clearly sees and wants to actively work on by hiring and developing women in such managerial positions in production.

Nele Thielert, who previously worked as an optician, notes that the flexibility of production work can improve her quality of life. »I enjoy the variety and the team spirit; the job is also more challenging,« she says.

All in all, MAN Energy Solutions demonstrates that promoting women in production not only enhances its attractiveness as an employer, but also contributes to a stronger workplace culture — one defined by collaboration and team spirit. Changing job profiles and breaking down old role models are crucial steps towards a more diverse and inclusive future in industry.



### Rubi Aranda: ship engineer at MAN Energy Solutions

How to succeed as a woman in a traditionally male-dominated industry: Rubi Aranda is one of the few women working as a ship engineer at MAN Energy Solutions.

Rubi graduated from the Technical University of Panama with a degree in Marine Engineering in 2019 and then completed her master's degree at Dalian Maritime University in China. In September 2023, she started her career at MAN Energy Solutions in our service base in Panama — the ideal place to learn: »Dozens of ships pass through the Panama Canal every day,« says Rubi Aranda. Rubi has been involved in challenging projects right from the start, such as upgrading the gas injectors on our two-stroke engines. Her team's main task is to improve the overall performance of dual-fuel engines and help with the installation of updates. »I feel like my job is important and I can make a difference,« says the young woman.

Her work is often physically demanding when she is in rough seas or tropical heat, for example, but this is something she is happy to accept. What she particularly appreciates about her job is the cultural diversity and interpersonal encounters: »Because the maritime industry in Panama is so international, I have met people from all over the world. I really enjoy it,« she says. »I think we need to be open-minded because there are so many different customs.«

Rubi's experience and her satisfaction with her role at MAN Energy Solutions show that women can be as successful in technical professions as their male counterparts. Rubi wants to be a role model here: »I hope that other girls and women will be inspired by my example to get into ship technology as well.«



### Celebrating Women in Region Americas: promoting diversity and inclusion at MAN Energy Solutions

With the »Celebrating Women in Region Americas« initiative, MAN Energy Solutions highlights a corporate culture in which women are recognized and promoted, and overcomes the challenge posed by women still being underrepresented in certain areas. The aim of the project was to promote diversity and inclusion as essential components of corporate culture, tap into the potential of women and create a

supportive, appreciative working environment. The specific measures involved in Celebrating Women in Region Americas included mentoring programs, training sessions, and events specifically designed to promote women. The focus was on the skills they possess that enrich the company and the strategies they use to assert themselves in a traditionally male-dominated environment.

The measures from Celebrating Women in Region Americas help MAN Energy Solutions be regarded as an attractive, women-friendly employer.

»Things like the woman network and the innovative spirit create a workplace where I feel supported and inspired every day.«

**Léonie Sutter,**  
Engineer Optimization Projects at MAN Energy Solutions Panama



# Society and supply chain



As a large manufacturing company, we have a huge responsibility when it comes to human rights and the environment, both in our external supply chain and in our own internal business. We live up to this responsibility by complying with voluntary commitments, regulations and standards regarding environmental and human rights, and occupational safety. They are decisive for our actions and an essential part of our strategic mission statement. Specifically, we implement this through appropriate programs, management systems, and initiatives.

Our activities in the supply chain were put into a new legal framework with the German Supply Chain Due Diligence Act (LkSG), which entered into force on 01/01/2023. It imposes new, stricter requirements for environmental protection and human rights on companies over a certain size throughout the entire supply chain – both externally and in our own business. A wide range of measures have been put in place, such as a four-phase risk management process (Evaluate, Prevent, Detect, React) and an anti-corruption check, to meet these requirements.

## Responsibility in the internal supply chain

When it comes to our own internal business, we generally take a much broader view of our obligations than is required by law in many respects. Our integrated management system (IMS), which comprises the three standards of quality management, environmental management and occupational health and safety, forms the strategic framework for our measures in our internal business. All our production sites are certified. Here, too, we are developing the requirements we place on ourselves and thus making more and more effort: For example, since 2021, we have also been using a new Compliance Management System Health, Safety and Environment (CMS-HSE), which has expanded our environmental protection and occupational safety requirements to include additional aspects and established a standardized, transparent process that can be used to report suspected irregularities quickly and effectively if necessary.

Our Code of Conduct (CoC), which all our employees must abide by, plays an important role. The comprehensive information, such as on human dignity and environmental protection, and practical examples it contains, make the CoC a valuable aid in everyday working life. The fact that there is mandatory training on the CoC for all employees, which can be completed either online or in person, also underlines just how central a role the CoC plays.



## Responsibility in the external supply chain

Supplier and partner companies play a very important role in our value chain and contribute significantly to our success. We currently work with about 15,000 active companies supplying us from about 80 countries. These are mainly European countries, as well as those where we have a production site. This means that we have a lot of responsibility for the people employed by our suppliers, as well as the potential environmental impact of these companies. In order to meet our extremely important responsibilities regarding human rights and the environment within this extensive external supply chain, MAN Energy Solutions has had comprehensive regulations, processes and audits in place for years, which we constantly adapt to the latest legal frameworks as well as our own expectations and ambitions.

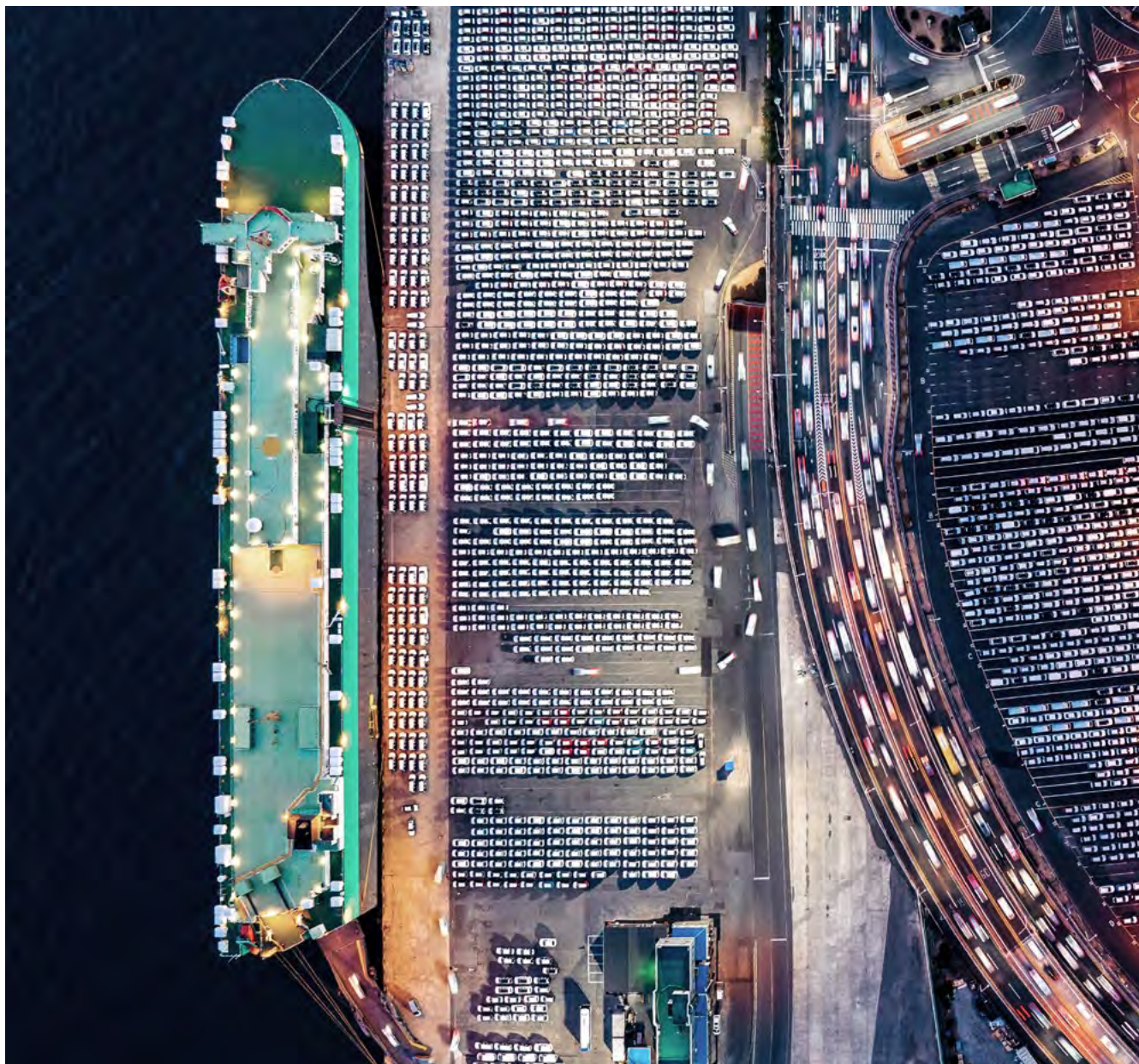
Our Code of Conduct for suppliers and business partners plays a key role in risk management and is binding for them. This agreement already sets out a very concrete framework with regard to our expectations surrounding the observance of human rights and environmental protection. In order to fulfil our due diligence obligations, we have devised or already implemented various measures over recent years.

Especially with the implementation of the German Supply Chain Due Diligence Act, we have been able to significantly increase



transparency in our supply chain in terms of human rights and environmental issues and initiate appropriate measures where required. To this end, we also report to the responsible German Federal Office on an annual basis and make this report publicly available. The same applies to our human rights principles, which we have set out in our [Mission Statement](#).

In 2024, we continued the evaluation of our external suppliers for relevant risks which began in 2022, against the background of the German Supply Chain Due Diligence Act. For this purpose, we chose different approaches for our production and general material suppliers (energy, electricity, office supplies, consulting, etc.) to address their relevant risks separately. When it comes to general material, a matrix for assessing the risk exposure of certain industries or industrial sectors was used for risk analysis, whereby areas such as security services or IT, for example, are ranked as more critical than others in terms of potential human rights violations. For production materials, we used country indicators to classify supplying companies in terms of their potential risk. This systematic approach to categorizing suppliers was supplemented by individual workshops with our various purchasing divisions to include the individual risk perceptions of our experienced buyers. This is an annual or continuous process. As a next step, suppliers with high risk exposure



have to disclose extensive information about their business practices using detailed self-report sheets through an external service provider. This information is checked and appropriate action is taken if necessary.

The supplying companies are evaluated in the form of a »traffic light system«. We have been taking the results of this risk analysis into account in our procurement processes since 2023, such as with the weekly procurement meeting held by our sourcing committee.

Beyond these legal requirements, however, we also set our own objectives to become better and better in this area. We have been working on an evaluation scheme since 2024 so as to be able to measure our suppliers' performance in terms of sustainability even better in the future. The aim here is to record and evaluate a wide variety of criteria related to human rights and the environment and clearly present them in a scorecard. We want to create a basis to be able to take sustainability criteria into account in the placing process even more in the future.

In addition, suppliers who have been highly rated in the risk assessment are then trained on issues related to the environment and human rights through an external service provider. Internally, too, we carry out continuous training and hold regular information meetings on sustainability issues for employees in the purchasing department.

## Social commitment

We are aware that, as a company, we are an integral part of society. By participating in environmental and social activities through sponsorships and donations, we want to make a positive contribution to the well-being of the community.

Various MAN Energy Solutions sites each independently support local social projects. An example of this is the inclusion sports project »Inklu-Kicker« run by RSV Adler 1914 e.V., which is subsidized by the MAN Energy Solutions site in Oberhausen. As part of this project, children with and without a handicap play football together in a team — and have great fun doing so. Our site helped the club with a donation in 2024 so that they could purchase much-needed balls and kit for the players. This gave a helping hand not only to the club, but also to the families who cannot easily afford new sportswear. MAN Energy Solutions Oberhausen is not only concerned with providing help in the site's immediate vicinity with their efforts here, but also with taking a stand in favor of diversity.



### »Diversity Management i Skills«: Promoting skilled workers and training in Denmark

Every year talented young people who are completing their vocational training compete in the »DM i Skills« in their fields of expertise. This Danish Championship of Professions was initiated by SkillsDenmark, a non-profit organization committed to sharpening the focus on vocational training and increasing its value. SkillsDenmark is supported by the Danish Ministry of Education and various labor market partners, professional committees, vocational schools, foundations and companies.

MAN Energy Solutions Denmark, head-quartered in Copenhagen, also played its part: For the DM i Skills held at the Dyrskuepladsen in Roskilde on May 1, 2024, we supported the event accompanying the competition with a panel discussion on sustainability and challenges in times of a skills shortage.

Our aim of engaging in DM i Skills is to promote training to create skilled workers and thus also support young talent and increase the visibility of MAN Energy Solutions as an attractive employer among our trainee and career starter target audience. For this reason, we have already given our support to various educational activities in the municipality of Roskilde, such as the pitch competition and »Matchmaking Day« at the



University of Roskilde. These are biennial events in which companies present business challenges to around 250 bachelor and master students with the aim of bringing the companies together with interested project groups. The events have already sparked interesting and new perspectives on challenges such as attracting talent and conduct when working from home, while also introducing students to MAN Energy Solutions in Denmark. As a result of these events, there has already been more than ten cooperation projects and various theses, and multiple student assistants, interns and new staff members have been recruited.

# Integrity and compliance

**A**s a global company that is active in many business areas, MAN Energy Solutions has a corporate responsibility to its customers, employees, investors and the public. Part of this corporate responsibility is complying with the law, everywhere and always, respecting ethical values and acting with integrity. We ensure that we comply with all binding commitments on aspects relating to sustainability and implement appropriate standards in our company.

An important role is played here by our shared foundation of values, which we have laid down in our Code of Conduct. This is binding for employees and provides a foundation based on ethics and values for employees to act in a compliant manner and with integrity within our company. Examples are used for clarification so as to guide and support decision-making processes in everyday business. There is also a specific Code of Conduct for companies we work with, which clearly communicates our ethical standards. We also require our suppliers, business partners and their employees to respect the law and to behave responsibly and with integrity.

Our Group-wide integrity and compliance program also addresses white-collar crime, with particular regard to combatting corruption, preventing money laundering and anti-trust law. The aim is to prevent compliance violations (prevention), detect compliance violations that can occur despite preventive measures as early as possible (detection) and react quickly and efficiently to compliance violations (response and accountability).



## Prevention:

The aim of the compliance organization is to further establish and promote awareness and understanding of responsible and honest behavior among all MAN Energy Solutions employees, suppliers and business partners.

## Detection:

Integrity and compliance with laws within the MAN Energy Solutions Group are top priorities. In order to ensure these values, MAN Energy Solutions has put in place clear and transparent processes to ensure that violations of the law are identified, investigated and promptly remedied.

## Response and accountability:

The right response to compliance violations and misconduct is critical. The negative impact of a breach is minimized by holding those responsible accountable and ensuring that our commitment to conducting business with integrity remains intact.

A »speak up« culture is essential for compliance with these high standards, and we explicitly encourage it: Any suspected compliance violation can be reported anonymously and securely via a whistleblower system. The channel is accessible to employees, customers, suppliers and business partners. All whistleblowers who act in good faith are protected from discrimination and retaliation. The information will be forwarded to an independent body for investigation.

# Key figures and additional information

## Economic development

The key financial figures continue to show very positive development. This shows us that our strategic direction and our growth program, which we successfully launched in 2023, are having an impact. This helps us to further accelerate the transformation of MAN Energy Solutions into a solution provider for climate-friendly energy solutions. Incoming orders rose by 5 percent compared to the previous year, and sales also increased by 7 percent. 5.6 percent of sales were channeled into R&D, which represents a slight increase compared to previous years and thus led to an increase in R&D expenses. Profitability (return on sales) fell by 1.3 percentage points to 7.8 percent, the level of 2022, which corresponds to an EBIT of 337 million euros.

	<b>2024</b>	<b>2023</b>	<b>2022</b>
<b>Orders received (in million €)</b>	5 307	5 039	4 260
<b>Turnover (in million €)</b>	4 333	4 044	3 565
<b>Investments (in million €)</b>	156	110	72
% of turnover	3.6	2.7	2.0
<b>Research and development (in million €)</b>	245	214	188
% of turnover	5.6	5.3	5.3
<b>EBIT (in million €)</b>	337	369	280
<b>RoS (in %)</b>	7.8	9.1	7.8

## EU taxonomy

Our work as part of economic activity »3.2 Manufacture of plants for the production and use of hydrogen« recorded 34 million euros in sales revenue that are eligible in line with the taxonomy, also meeting the criteria for a substantial contribution. The majority of eligible sales revenue was attributable to economic activity »3.6 Manufacture of other low CO<sub>2</sub> technologies« (3.2 billion euros). For 102 million euros, the complex documentation requirements for showing a substantial contribution were met in the reporting

year. Economic activity »9.1 Close to market research, development and innovation« contributed a further 76 million euros to eligible sales revenue. However, due to the requirements for the DNSH criterion being altered with regard to the substitution test, no sales revenue (previous year a total of 95 million euros), capital expenditure (previous year a total of 62 million euros) and operating expenses (previous year a total of 69 million euros) could be reported as being aligned with the taxonomy in the reporting year.

	Taxonomy-eligible (in € million)	Substantial contribution to climate change mitigation (in € million)	Compliance with DNSH criteria (Y/N)	Compliance with minimum safeguards (Y/N)	Taxonomy-aligned (in € million)
<b>Sales revenue</b>	3 347	136	-	-	-
3.2 Manufacture of plants for the production and use of hydrogen	34	34	N	J	-
3.6 Manufacture of other low CO <sub>2</sub> technologies	3 237	102	N	J	-
9.1 Close to market research, development and innovation	76	-	-	-	-
<b>Capital expenditure</b>	227	131	-	-	-
3.2 Manufacture of plants for the production and use of hydrogen	93	93	N	J	-
3.6 Manufacture of other low CO <sub>2</sub> technologies	134	38	N	J	-
9.1 Close to market research, development and innovation	-	-	-	-	-
<b>Operating expenses</b>	244	80	-	-	-
3.2 Manufacture of plants for the production and use of hydrogen	11	11	N	J	-
3.6 Manufacture of other low CO <sub>2</sub> technologies	233	69	N	J	-
9.1 Close to market research, development and innovation	-	-	-	-	-

## Our stakeholders

As part of developing our new sustainability strategy, we have identified ten strategically important stakeholder groups. Through dialogue, workshops and continuous exchange with these stakeholder groups via various channels of communication, we can gain valuable insights that significantly shape our strategic orientation and sustainability management. This enables us to systematically record and evaluate the diverse expectations and requirements of our sustainability strategy.

Internal	External	
Executive Board	Politics & Regulatory agencies	Financial institutions
Volkswagen / Shareholder	Suppliers & Business partners	Local Authorities
Employees	Customers	Press & Media
	Competitors	

## Alliances and partnerships

We only engage in alliances and partnerships where added value can be created. On this page you can read about some select initiatives that we contribute to. These include several VDMA working groups and project groups on sustainability, at local level the Augsburg Climate Pact or LowCarbonSG in Singapore.

We are also pleased to renew our membership in the Sea-LNG coalition, underlining our commitment to technical excellence and sustainable maritime solutions. As part of our continuous efforts in the areas of transparency and sustainability, we successfully participated in the EcoVadis sustainability rating. This independently

assesses our progress in the areas of the environment, social affairs and corporate governance. At the request of our customers, we also make our complete CDP questionnaire available so as to share comprehensive information on our work in the field of climate change mitigation and strategies to reduce environmental impacts.

\*We acknowledge that our parent company Volkswagen AG participates in the UN Global Compact, and we support the Ten Principles and Advancement of the Sustainable Development Goals as well as broader UN goals. We consolidate our support for this initiative fully under our parent's commitment. Therefore, we do not participate in UN Global Compact activities nor do we participate in activities of a Global Compact Country Network.

## Results of the double materiality assessment

The tables below detail the sustainability-related impacts, risks, and opportunities that we identified and rated as material as part of our double materiality assessment. Eight out of ten ESRS categories are significant for MAN Energy Solutions.

### Environment

ESRS category	Material topics	Impact category	Impact description
<b>Climate change</b> <b>Greenhouse gas emissions</b> and reduction of fossil fuel and green energy consumption along the value chain	Climate change mitigation	Negative	Conventionally powered (ship) engines cause global greenhouse gas emissions by burning fossil fuels.
		Positive	Our decarbonization technology for hard-to-decarbonize sectors, particularly CCUS systems and hydrogen solutions, is actively reducing industrial CO <sub>2</sub> footprints.
		Opportunity	The growing market for climate-friendly technology is creating new business opportunities in the field of emissions reductions.
	Energy	Negative	The energy needed to operate conventional systems requires significant global energy resources.
		Positive	We are increasing industrial energy efficiency through innovative technology, such as large heat pumps and highly-efficient components.
		Opportunity	Our technology and solutions for decarbonizing »hard-to-abate« sectors and supporting the transition from fossil fuels to renewable energy and future fuels provide MAN Energy Solutions with an economic opportunity.
<b>Pollution</b> Local air quality/air pollution due to production processes and product use	Pollution of air	Negative	Local air quality can be affected during our products' operational phase, particularly in port areas.
		Positive	However, the development of future fuels such as ammonia shows promising potential for significantly reducing air pollution.
<b>Biodiversität</b> Effects on ecosystems & species due to the procurement of raw materials, land use, pollution or habitat degradation along the value chain	Impact on species	Negative	Underwater noise from ship engines can influence marine wildlife and potentially have a negative impact on their behavior and communication. We are actively developing solutions to minimize these effects.
<b>Circular economy</b> Use of resources for production and purchased primary products, recyclable product design, lifetime extension, waste prevention and disposal of sold products at the end of their lifetime	Resource inflows	Negative	Our production depends on primary raw materials such as iron ore and coal, and the demand for resources is high, particularly in the marine and energy sectors.
	Resource outflows	Positive	Our products are highly durable and can be repaired. These factors, combined with the comprehensive maintenance services and upgrade options provided, significantly extend product life cycles and save valuable resources.
	Waste	Positive	Our commitment to circular principles is reflected in the high use of secondary materials in our casting processes and our development of reconditioning programs, where older components are prepared for reuse. While recycling is primarily done locally due to size and weight, we actively promote circular economy principles in our design and manufacturing processes.

## Social

ESRS category	Material topics	Impact category	Impact description
<b>Own workforce</b> Job security, equality, fair pay, health and safety, work-life balance, collective bargaining, further education and training, anti-discrimination, etc.	Working conditions	Positive	It is important to us to create safe and healthy working conditions for our employees and contractors, both at our sites and in the field. We are ISO 45001 certified and are constantly working to raise awareness, reduce our accident figures and improve our operational efficiency.
	Equal treatment and opportunities	Positive	We actively promote diversity, equal opportunities, and inclusion throughout our organization. Through targeted programs and initiatives, we work to increase gender diversity in management positions and ensure equal access to further education and development opportunities.
<b>Workers in the value chain</b> Health and safety, fair working conditions, promotion of freedom of association, protection of human rights, child and forced labor, modern slavery	Working conditions	Positive	Our commitment to responsible supply chain management is enshrined in our Code of Conduct. We conduct comprehensive supplier risk assessments and set strict standards to protect human rights along our value chain.
	Other work related rights	Positive	Through close cooperation with our suppliers, we actively work to ensure fair pay and safe working conditions.
<b>Consumers and end-users</b> Provision of secure products (technical security, but also IT and cyber security)	Personal safety for consumers and/or end users	Positive	We pay careful attention to product safety to ensure personal safety when operating our products. To do this, we train customers and employees and provide our customers with information.
		Negative	Despite comprehensive safety standards, we are aware that potential weaknesses when it comes to safety could have serious consequences.

## Governance

ESRS category	Material topics	Impact category	Impact description
<b>Business conduct</b> Business ethics, management of relationships with suppliers, political activities & influencing	Corporate culture	Positive	Our corporate culture is based on strong ethical principles and integrity. Compliance with legal regulations, internal rules, the principles laid down in our Code of Conduct and the Code of Conduct for business partners is a top priority at MAN Energy Solutions.
	Corruption and bribery	Positive	We take a zero-tolerance approach to corruption and bribery, and this is supported by mandatory training programs and robust compliance systems.
		Negative	Incidents involving corruption and bribery can have a big impact if they occur.
	Protection of whistleblowers	Positive	Our modern whistleblower system provides secure channels for reporting potential misconduct anonymously. The information is handled in a fair, fast and secure process.

## Employees

The number of employees has been steadily increasing since 2022 and, in line with our strategic orientation, should continue to grow with qualified staff over the coming years. The increase in female employees was slightly above average in 2024, so the proportion of women in our core workforce has risen once again and is now at 17 percent. The increasing utilization of our plant capacities is also reflected in the growth of our value-adding workforce, so that, in 2024, the number of temporary workers remained relatively constant compared to the previous year.

The number of trainees also continues to rise, and particularly worthy of note is the number of those completing training with very good grades, which remains high. MAN Energy Solutions has been focusing on providing high-quality training for many years and is thus nurturing its own young talent, hiring 100 percent of its trainees after training completion.

### Structure of the workforce<sup>1</sup>

	2024	2023	2022
<b>Core workforce</b>	15 220	14 702	13 836
thereof female	2 588	2 409	2 166
thereof male	12 632	12 293	11 670
<b>thereof part-time employees</b>	605	580	516
thereof female	362	351	320
thereof male	243	229	196
<b>thereof employed on a temporary basis</b>	424	426	413
thereof female	77	66	73
thereof male	347	360	340
<b>Trainees</b>	518	468	488
thereof female	94	86	80
thereof male	424	382	408
thereof in Germany	349	303	335
thereof new hires in Augsburg	61	45	43
Hire rate after training completion in % in Augsburg	100	95	96
<b>Employees in semi-retirement passive phase</b>	478	308	247
<b>Workforce</b>	16 216	15 478	14 571
<b>Temporary workers</b>	355	368	200

<sup>1</sup> At the end of each year

### Employees of MAN Energy Solutions

	2024	2023	2022
<b>Workforce (value-adding)</b>	15 575	15 070	14 036
Germany	7 352	7 148	6 675
Abroad	8 223	7 922	7 361
<b>Share abroad in %</b>	52.8	52.6	52.4

### Age structure

	2024	2023	2022
<b>Core workforce</b>	15 220	14 701	13 836
≤ 30	2 221	1 755	1 828
31 – 40	4 472	4 187	4 080
41 – 50	4 315	4 167	3 794
51 – 60	3 479	3 500	3 395
> 60	733	1 092	739

## Women in leadership positions

Despite the restructuring program that ran until 2023, the proportion of women in the core workforce had already been increased in previous years. There was also an increase in the proportion of women across all employee groups in the reporting year. We were also pleased to welcome a female executive to the top management team for the first time in 2024.

	2024	2023	2022
Percentage of women in the core workforce	17.0%	16.4%	15.7%
Percentage of women in the core workforce	12.6%	11.1%	10.4%
Percentage of women in senior management	8.5%	6.2%	4.2%
Percentage of women in top management	16.7%	0	0
Percentage of women in management overall (lower, senior & top)	11.3%	9.2%	8.0%



## Measures for qualification

Providing continuous training to our employees is essential. We require expertise on methods, technology and change for our transition to a solution provider, our »Moving big things to zero« strategy and to develop new technology. The qualification program set up for this purpose was in high demand and will continue to be expanded into the future. In total, we were able to register almost 60,000 participants on our qualification program, with around 345,000 hours spent. Many of the training courses were completed via our eAcademy or online, but face-to-face events were also offered for certain topics or target audiences.

	2024	2023	2022
<b>Participation in the qualification program</b>	58 896	72 730	89 696
<b>Qualification hours</b>	343 232	341 944	262 886
of which time-independent qualification (e-learning)/people	41 555	50 965	70 047
of which time-independent qualification (e-learning)/hours	98 791	45 731	54 053
<b>Ø Qualification hours per employee</b>	21.40	22.63	19.45





## Occupational safety and environmental protection

The following figures for 2023 apply exclusively to our 12 production sites: Augsburg, Oberhausen, Berlin, Deggendorf (Germany), Copenhagen, Frederikshavn (Denmark), Zurich (Switzerland), Saint-Nazaire (France), Velká Bíteš (Czech Republic), Aurangabad, Bangalore (India) and Changzhou (China).

### Accidents at work

While we are seeing a slight increase in accidents at work, our commitment to prevention and employee safety remains strong. We pay the utmost attention to occupational safety. Our clear goal is to continuously reduce the accident frequency index and severity of accidents. Current developments motivate us to make our prevention measures even more targeted and systematic. Numerous prevention measures have already been implemented. We are continuously developing further measures to increase the safety of our employees.

	2024	2023	2022
<b>Accidents at work with an absence of ≥ 1 day</b>	157	150	145
<b>Days of absence due to accident</b>	3 221	2 363	2 513
<b>Fatal accidents at work</b>	0	0	0
<b>Index of accident frequency - RIF (Recordable Injury Frequency)<sup>1</sup></b>	12.50	11.81	11.21

<sup>1</sup> Number of recordable accidents at work requiring medical care x 1 million / hours worked

## Energy consumption in MWh

The proportion of renewable sources in the company's electrical energy consumption increased significantly from 2022 to 2024, and was already at 98 percent in the 2024 reporting year. Thermal energy consumption (approx. -4 percent) and fuel use at the sites (-6 percent) also developed positively overall.

	2024	2023	2022
<b>Total energy consumption</b>	278 300.63	288 591.42	285 424.06
<b>Electric energy consumption</b>	86 044.07	85 623.26	83 257.99
Elec. energy consumption from ren. energy sources - own generation	1 866.89	1 173.61	741.40
Elec. energy consumption from ren. energy sources - external generation	82 018.69	81 859.45	77 829.95
Elec. energy consumption from conv. energy sources - external generation	2 158.50	2 590.19	4 686.64
<b>Thermal energy consumption</b>	33 450.54	34 950.59	39 099.45
Thermal energy consumption from ren. energy sources - own generation	0.00	0.00	0.00
District heating consumption from ren. energy sources - external generation	0.00	0.00	0.00
District heating consumption from conv. energy sources - external generation	33 450.54	34 950.59	39 099.45
<b>Site fuel use</b>	154 522.83	164 373.03	158 476.37
Heating oil <sup>1</sup>	426.35	2 243.02	1 289.89
Natural gas	113 137.83	125 507.36	127 552.04
Diesel for company vehicles	1 609.65	1 622.15	1 482.08
Petrol for company vehicles <sup>2</sup>	2 115.38	444.05	342.76
Consumption of light and medium-weight mineral oils as fuel for test benches	37 723.47	35 555.60	27 418.34
Heavy oil consumption as fuel for test benches <sup>3</sup>	0.00	108.63	1 771.30

Kerosene consumption as fuel for test benches <sup>3</sup>	738.00	450.07	444.8
Propane for test benches <sup>4</sup>	254.00	508.34	0.00
Methanol for test benches <sup>5</sup>	2 023.88	-	-
Ammonia for test benches <sup>5</sup>	219.30	-	-
Biomass	0.00	0.00	0.00
<b>Fuel gases for manufacturing processes</b>	558.16	1 186.34	2 368.41
Acetylen (Ethin, C <sub>2</sub> H <sub>2</sub> )	442.11	1 060.8	1 846.14
Propane <sup>4</sup>	17.41	22.13	437.34
Hydrogen	98.63	103.39	84.92

<sup>1</sup> Due to the gas shortage in 2022/23, heating oil was stored in larger quantities. After the situation surrounding the gas supply eased off in 2023, these heating oil reserves were increasingly used.

<sup>2</sup> The significant increase in petrol consumption results from the inclusion of petrol and diesel consumption by privately-used company vehicles.

<sup>3</sup> Mineral oil consumption depends on the number of test runs. Only a few test runs were carried out with heavy oil in 2023 and none in 2024. In contrast, there was an increase in test runs with light and medium-weight mineral oils.

<sup>4</sup> Since 2023, propane has been separately listed for test benches. Until then, propane for test benches had been included under propane for manufacturing processes.

<sup>5</sup> Methanol and ammonia have been recorded for test benches since 2024.

## CO<sub>2</sub>-emissions in t

In 2024, we recorded a significant reduction in scope 1 emissions compared to the previous year. In addition, through targeted measures, we succeeded in further reducing scope 2 emissions and thus successfully continuing the already positive development trend.

In accordance with the World Business Council for Sustainable Development and scope 3 standards published by the World Resources Institute as part of the GHG Protocol, CO<sub>2</sub> emissions based on 5 of a total of 15 scope 3 categories will be reported for the first time in 2024.

	2024	2023	2022
<b>Total carbon dioxide emitted from own activities (scope 1 and 2)</b>	40 012.47	46 094.28	40 972.85
<b>Directly emitted carbon dioxide (scope 1)</b>	35 001.25	40 516.75	33 389.90
<b>Indirectly emitted carbon dioxide from energy consumption (scope 2)</b>	5 011.23	5 577.53	7 582.96
<b>Indirectly emitted carbon dioxide in the value chain (scope 3)<sup>1</sup></b>	50 163 534.00	-	-

<sup>1</sup> comprises scope 3 categories 3.1 (purchased goods and services), 3.4 (transport and distribution – upstream), 3.9 (transport and distribution – downstream), 3.11 (use of sold products) and 3.12 (handling of sold products at the end of their life cycle)



## Recycling and waste in t

In 2024, the total waste volume significantly reduced compared to the previous year and is even below the level of 2022. The largest reduction (-90 percent) was achieved in non-hazardous and non-production-specific waste for recycling.

	2024	2023	2022
<b>Total amount of waste</b>	19 276.42	29 549.81	20 246.57
<b>Total amount of waste for recycling</b>	9 454.82	18 962.06	9 016.07
<b>Hazardous waste for recycling</b>	1 378.12	1 754.36	1 590.58
Hazardous non-production-specific waste for recycling	65.38	610.09	139.18
Hazardous production-specific waste for recycling	1 312.74	1 144.27	1 451.40
<b>Non-hazardous waste for recycling</b>	8 076.69	17 207.70	7 425.50
Non-hazardous non-production-specific waste for recycling <sup>1</sup>	895.42	9 204.65	567.8
Non-hazardous production-specific waste for recycling <sup>1</sup>	7 181.28	8 003.05	6 857.70
<b>Total amount of waste for disposal</b>	1 094.46	1 337.93	2 043.35
<b>Hazardous waste for disposal</b>	759.93	937.86	865.94
Hazardous non-production-specific waste for disposal	55.17	13.46	12.52
Hazardous production-specific waste for disposal	704.76	924.40	853.42
<b>Non-hazardous waste for disposal</b>	334.53	400.07	1 177.42
Non-hazardous non-production-specific waste for disposal	13.03	116.45	813.11
Non-hazardous production-specific waste for disposal	321.50	283.62	364.31
<b>Metal waste</b>	8 727.14	9 249.82	9 187.14

<sup>1</sup> In 2023, new construction, renovation and demolition resulted in a relatively large amount of non-production-specific waste. In 2024, the amount of waste returned to normal.

## Water and waste water in m<sup>3</sup>

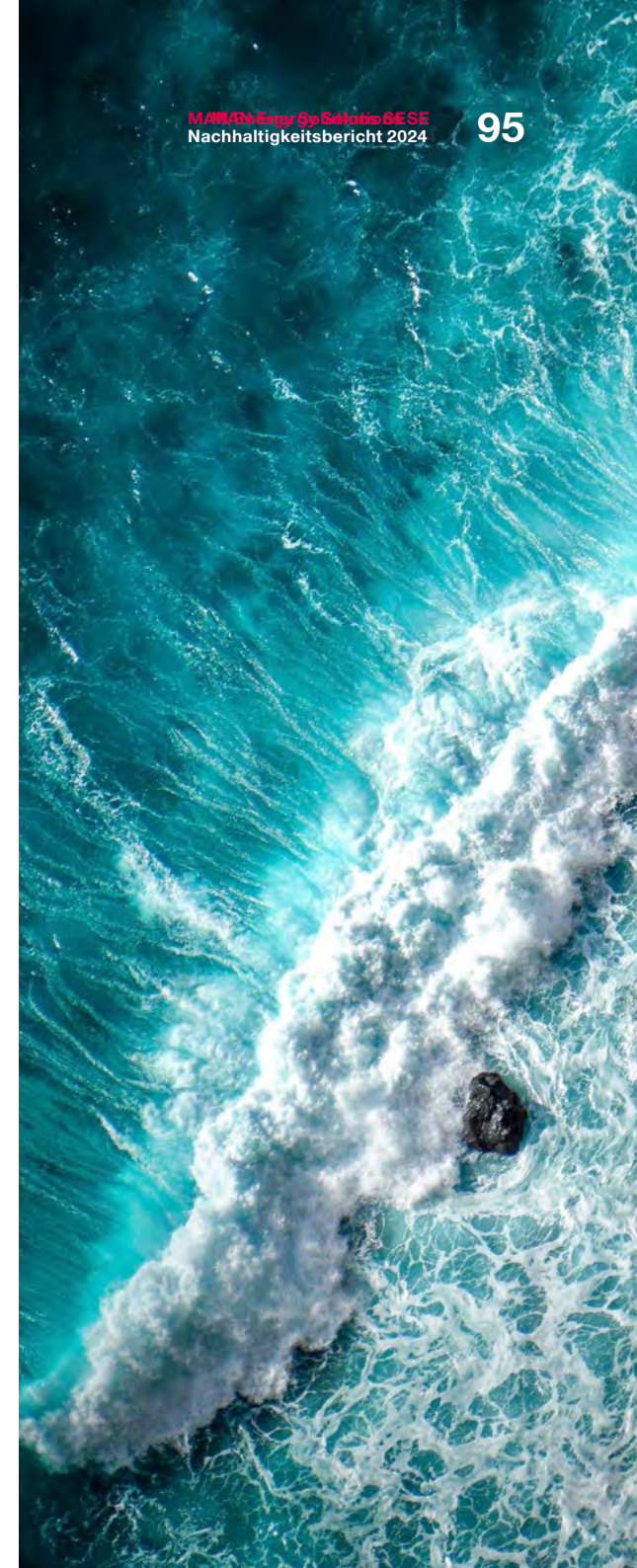
Fortunately, utility water consumption reduced again in 2024, following an increase in the previous year due to increased demand for production and test benches. Particularly positive is the significant increase in the water recycling volume, which underlines our commitment to sustainable resource management.

	2024	2023	2022
<b>Total fresh water volume</b>	138 404.42	159 073.96	3 502 161.91
Fresh water volume procured externally, including drinking water	88 394.42	106 789.06	108 333.01
Fresh water volume self-produced (well water) <sup>1</sup>	50 010.00	51 934.90	3 393 828.90
<b>Surface water from lakes, rivers, seas<sup>1</sup></b>	6 769 982.10	7 596 400.00	3 234 366.00
<b>Rainwater used<sup>2</sup></b>	0.00	350	120
<b>Recycled water volume</b>	4 276.20	3 588	3 531
<b>Waste water volume<sup>3</sup></b>	183 986.94	329 812.7	328 815.27

<sup>1</sup> As a result of the indicators being adjusted, a significant proportion of the amount of water classified as fresh water from own production in previous years has been counted as surface water from lakes, rivers and seas since 2023. This is not discharged as waste water, but remains chemically unchanged and is recirculated nearby.

<sup>2</sup> Due to there being more rainfall in 2024 compared to 2023, it was not necessary to use collected rainwater for irrigation.

<sup>3</sup> Rainfall is no longer included in this indicator.



## Air pollutant emissions in t

The situation surrounding air pollutant emissions in 2024 is a mixed one: Sulphur dioxide (SO<sub>2</sub>) emissions reduced slightly compared to the previous year, continuing the positive trend seen in recent years. In contrast, we recorded a moderate increase in nitrogen oxides (NO<sub>x</sub>) compared to 2023. The total dust pollution increased slightly, while we were able to achieve a pleasing reduction in emissions of volatile organic compounds (VOCs).

	2024	2023	2022
Sulphur dioxide (SO <sub>2</sub> )	7.23	7.37	13.41
Nitrogen oxides (NO <sub>x</sub> )	185.74	177.68	149.85
Total dust	3.52	3.38	2.97
Emissions of volatile organic compounds (VOC)	34.92	38.18	36.08

## Certificates for production sites

All our production sites are triple certified according to the mentioned standards.

	2024	2023	2022
Site with ISO 14001	12	12	12
Site with ISO 9001	12	12	12
Site with ISO 45001	12	12	12



## Production sites near or in biodiversity-sensitive areas

The assessment of the potential environmental impacts and ecosystem dependencies of our production sites in accordance with the ENCORE classification shows a uniform risk profile with a medium rating. At all sites, the potential effects and dependencies of ecosystem services were consistently assessed as medium. The relevant environmental aspects

include sources of disturbances (noise, light), emissions of ground and water pollutants and water-related factors (consumption, supply, treatment, flow regulation). Flood protection and the mitigation of storm effects were also consistently rated as medium risk.

	Site	Augsburg plant	Berlin plant	Deggendorf plant	Frederikshavn plant	Copenhagen plant	Saint-Nazaire plant
<b>General information</b>	Country	Germany	Germany	Germany	Denmark	Denmark	France
	Plant area [ha]	30.6	3.1	5.8	12.4	5.5	5.1
<b>Ecological status of the area</b>	Biodiversity Intactness Index (BII) [%]	36.9	38.7	50.2	40.7	34.1	29.1
	Mean species abundance (GLOBIO) [%]	26.3	26.3	26.3	26.3	26.3	26.3
<b>Biodiversity-sensitive areas</b>	Number of protected areas (radius 4500 m)	3	4	3	3	1	5
	Names of protected areas	<ul style="list-style-type: none"> <li>- Lechauen north of Augsburg</li> <li>- Lechauen between Königsbrunn and Augsburg</li> <li>- Höh-, Hörgelau-, und Schwarzgraben, Lechbrenne north of Augsburg</li> </ul>	<ul style="list-style-type: none"> <li>- Waterworks Tegel</li> <li>- Tegeler Fließtal</li> <li>- Baumberge</li> <li>- Spandauer forest</li> </ul>	<ul style="list-style-type: none"> <li>- Danube wetlands between Straubing and Vilshofen</li> <li>- Isar estuary</li> <li>- Extensive meadows east of Deggendorf</li> </ul>	<ul style="list-style-type: none"> <li>- Hirsholmene</li> <li>- Hirsholmene, havet vest herfo og Ellinge A's udlob</li> <li>- Bangsbo Ada log omliggende overdre-somrader</li> </ul>	<ul style="list-style-type: none"> <li>- Vestamager og havet syd for</li> </ul>	<ul style="list-style-type: none"> <li>- Estuaire de la Loire Nord</li> <li>- Estuaire de la Loire</li> <li>- Baie de Bourdneuf</li> <li>- Estuaire de la Loire</li> <li>- Grand Brière, marais de Donges et du Brivet</li> <li>- Grande Brière et marais de Donges</li> </ul>

# Reporting methods

Sustainability is an integral part of our corporate strategy. In our Sustainability Report, we publish key information on our sustainability activities, including aspects such as strategy, organization, initiatives, programs, management systems and targets. This 2024 Sustainability Report is based on internationally established frameworks and regulatory requirements, with particular regard to the European Sustainability Reporting Standards (ESRS) in accordance with the Corporate Sustainability Reporting Directive (CSRD), the standards laid down in the Global Reporting Initiative (GRI, with reference), ESG sustainability ratings and the expectations of our stakeholders. As part of the Volkswagen Group, MAN Energy Solutions is a participant in the UN Global Compact, the world's largest initiative for sustainable corporate management.

## Reporting period and boundaries

This report relates to activities carried out by MAN Energy Solutions in the 2024 financial year (January 1, 2024 to December 31, 2024). Any exceptions are marked as

such. We report on our progress annually. As a rule, the report covers all MAN Energy Solutions business units and companies. Possible exceptions regarding the data pool used are marked (e.g. only production sites in scope). Minority shareholdings are not included in the report. To ensure comparability, the key performance indicators from previous years may be adjusted if necessary, and this will then be marked accordingly.

## Data collection and reporting

MAN Energy Solutions uses an energy, environmental, and occupational safety information system to collect and analyze reports from all relevant sites in all relevant countries. The reporting criteria were determined depending on the size and type of site. Our production sites and larger branches report on the full range of parameters such as energy use, resource consumption and emissions. Smaller sites only report on select parameters that are relevant for the respective site. Given the size and global presence of MAN Energy Solutions, data collection requires a distributed IT and data

environment to be used. The non-financial data collected may comply with local rules and regulations that may differ from the reporting requirements at overall company level. To ensure that non-financial reporting is consistent, the data collected is reconciled and adjusted to meet company-wide reporting requirements. Any information presented in this report that is subject to significant data limitations is marked as such. To ensure data quality and preserve the value of information, we identify and evaluate data limitations in accordance with our internal policies. If necessary, e.g. for consistency reasons, this may include the exclusion of affected data sources. As a result, our figures may not be comparable with data published by other companies under the same or similar names. The key performance indicators presented are a continuation of those from previous years. Significant changes in data collection and in measurement methods concerning our sustainability performance are explicitly indicated in the respective key performance indicators. Subsequent corrections to estimates may result in deviations from

the figures published in the previous year's report. All figures in the report are each rounded individually. This may lead to slight deviations when adding up. The use of the term »CO<sub>2</sub> emissions« in this report includes the consideration and identification of other climate-damaging greenhouse gases such as methane (CH<sub>4</sub>). All CO<sub>2</sub> emissions figures in this report relate to CO<sub>2</sub> equivalents.

## Report auditing

We have prepared our sustainability report in compliance with high quality standards. MAN Energy Solutions is also a subsidiary of Volkswagen AG. In addition to Volkswagen AG, the Volkswagen AG Sustainability Report includes all significant domestic and foreign subsidiaries that Volkswagen AG directly or indirectly controls. This includes MAN Energy Solutions. The consolidated Group Sustainability Report of Volkswagen AG is subject to a mandatory business audit by an independent auditing firm in accordance with the requirements laid down in the Corporate Sustainability Reporting Directive (CSRD).

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### News and further information

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