Gaining an Edge

The Role of Energy Efficiency in Industrial Competitiveness

INTERNATIONAL ENERGY AGENCY

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Table of contents

Summary for policymakers

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Energy efficiency delivers more than energy savings and emission reductions – it can also improve the competitiveness of countries and firms. From increased profitability to job creation, energy efficiency helps firms compete amid high costs, growing demand, and rising trade pressures. In today's global context, energy efficiency is not only a matter of energy policy, but also of economic policy.

Today the world's industries can produce nearly 20% more value for a given amount of energy than they could two decades ago. This progress has yielded significant benefits at the country level. G20 countries have doubled their economic output from industry and services since 2000 while only using 60% more energy, with efficiency gains resulting in cumulative savings equivalent to India's entire primary energy consumption.

However, the recent global slowdown in industrial efficiency progress risks weakening firms' competitiveness. The industrial sector is responsible for around 80% of the growth in global energy demand since 2019, yet its energy intensity has remained largely unchanged over the same period.

There is significant untapped potential at the firm level, and not only in heavy or large industries. The energy consumption of facilities making the same or similar products varies widely. In IEA countries, if all firms matched the energy consumption of the least energy-intensive peers in their subsectors, energy costs could be reduced by up to an estimated USD 600 billion. This opportunity is not only present in heavy industries, but also in the lighter industries that form the backbone of many economies, collectively accounting for half of global industrial value added and two-thirds of jobs.

Meanwhile, the manufacturing of energy efficiency technologies represents a new opportunity. Global investment in energy efficiency continues to accelerate, increasing by 150% since 2015. Rising indicators, from manufacturing capacity to RD&D investments, signal ongoing market growth. Firms that position themselves as producers, as well as users, of energy efficiency technologies stand to gain market share at a pivotal time.

While industry leaders recognise the competitiveness benefits of energy efficiency, they need help to overcome barriers to action. In an IEA survey of 1 000 firms around the world, around 80% of industry leaders report that efficiency is key to their competitiveness. However, respondents indicate that they face barriers to implementing more significant measures, including significant upfront costs and insufficient workforce capacity.

A renewed policy approach can position energy efficiency as a pillar of industrial strategy. With an expanded focus on SMEs and light industry in addition to heavy industry, policymakers have an opportunity to leverage best-in-class efficiency policies to not only save energy, but to also achieve broader economic objectives, such as improving productivity, growing local economies, and creating and safeguarding jobs.

Chapter 1.
Energy demand and competitiveness

Energy is at the centre of competitiveness amid high costs, growing demand, and rising trade pressures

Energy is a vital input into all productive sectors of the economy. In an environment of fierce global competition and shifting trade patterns, energy costs are a major determinant of long-term investment, jobs and business competitiveness. Finding ways to reduce energy costs while producing more or better products is good for both profitability and overall economic growth.

While energy prices are volatile in many countries, recent high prices combined with instability and fragmentation in energy markets have widened energy price gaps between regions. Concerns centre on how higher energy costs erode profitability, push up inflation and cause industries to downsize or relocate, due to shifting decisions on long-term investment.

Energy efficiency offers a way to structurally lower energy costs year after year, while providing the same or, in many cases, improved output. Investing in efficiency can also help firms to create or safeguard jobs, lower emissions, and achieve a more durable competitive advantage.

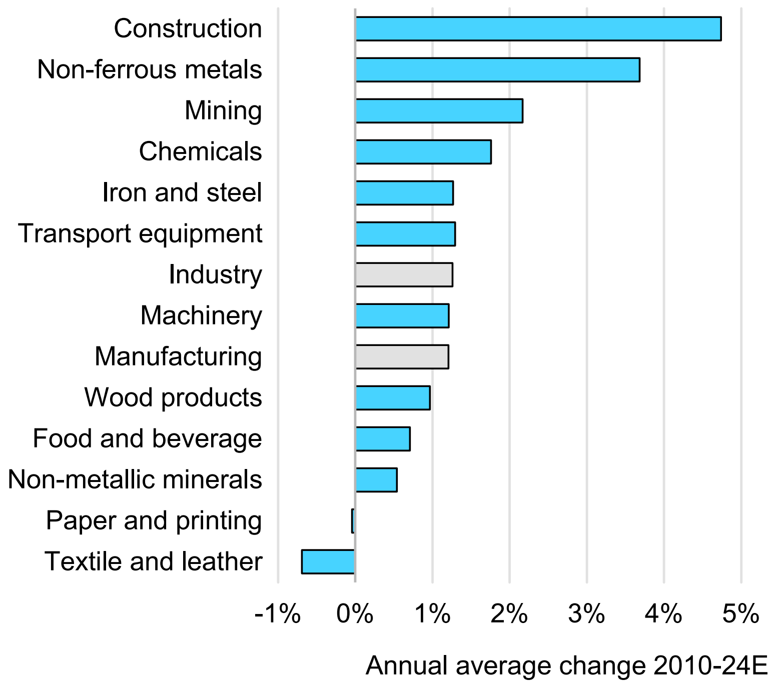
In the industrial sector, which accounts for 21% of world GDP (worth over USD 20 trillion), growing energy demand and rising trade pressures are placing energy – and the role of energy efficiency – at the heart of discussions on competitiveness.

For highly energy-intensive industries, managing energy costs can be a question of survival. These heavier industries (such as chemicals, metals, pulp and paper, refining and cement) are characterised by high fixed costs and capital-intensive processes, where efficiency improvements often require substantial upfront investment.

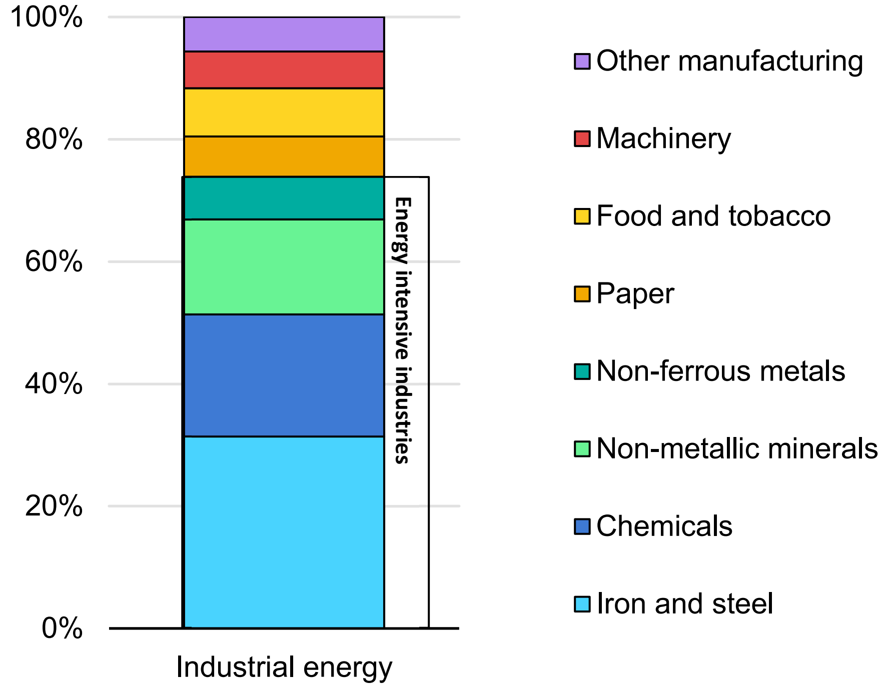
For less energy-intensive sectors (such as electronics, machinery, automobiles, textiles, and food and drink processing), energy generally plays a smaller role in overall costs. However, these lighter industries have significant potential to achieve cost-effective energy savings in the short term, with lower capital costs and greater potential for electrification. Managing costs in lighter industries is also crucial, not only to improve firm competitiveness but also to achieve broader economic objectives. While these sectors contribute around a quarter of industrial energy demand, they account for over half of industrial value added and two-thirds of jobs.

Energy-intensive industries are most exposed to energy-related risks, making up more than three-quarters of overall industrial energy demand and undergoing rapid growth

Industrial energy demand, average annual change 2010-2024e



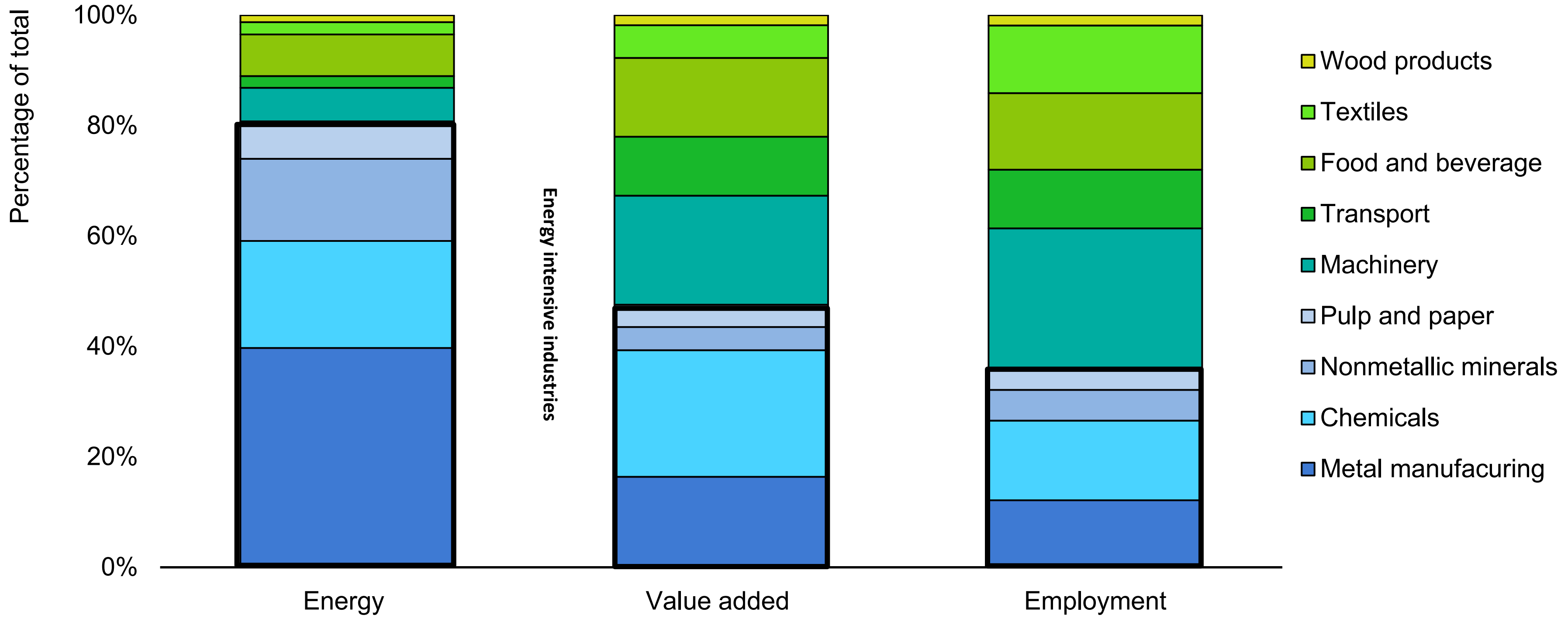
Share of total industrial energy demand, 2024e



Notes: 2023-24E assumes average 2010-22 growth rates. Manufacturing represents the largest share of total industrial energy demand. Energy consumption and losses from blast furnaces and coke ovens is included in steel manufacturing. Non-energy use in the chemical sector (e.g. feedstocks for plastics) is not included.
Source: IEA (2024), World Energy Balances.

Lighter industries account for less than a quarter of industrial energy demand, but over half of industrial value added and two-thirds of jobs

Share of manufacturing sector energy demand, value added, employment, latest common year of data, G20 countries



Notes: This chart shows data for manufacturing, which represents the largest component of industrial energy demand (excluding construction, mining and non-energy use in the chemical sector). Energy consumption and losses from blast furnaces and coke ovens is included in metals manufacturing. This chart reflects energy consumption in G20 countries only; shares thus differ slightly from the global average for industry as a whole. Base year for energy, value added, and employment data is 2022.

Sources: IEA analysis based on IEA (2024), World Energy Balances; UNIDO (2024) INDSTAT Revision 3.

Today the world's industries can produce 20% more value added with a given amount of energy than they could two decades ago

Over the last two decades, industrial energy efficiency gains, as measured by the energy intensity of global industrial value added, have been just under 1% per year on average. This means that, for a given amount of energy, the global industrial sector is now able to produce 20% more value added than in 2000. While this global improvement is also partly influenced by structural shifts, this trend underscores the substantial progress made in industrial energy efficiency over the years, enabling increased economic output without a corresponding rise in energy consumption.

However, not all regions and countries have progressed at the same rate. The People's Republic of China (hereafter "China") saw strong progress, with average annual industrial energy intensity improvement of 2.4% since 2000. This rate of improvement was followed by Japan at 2.1% and the United States at 1.9% on average per year over the same period. India also achieved a 0.4% improvement per year, while Brazil's industrial energy intensity actually increased over the period by 0.7% annually. Today, some countries use less than half the energy of other countries to produce similar economic output, in both heavy and lighter industry.

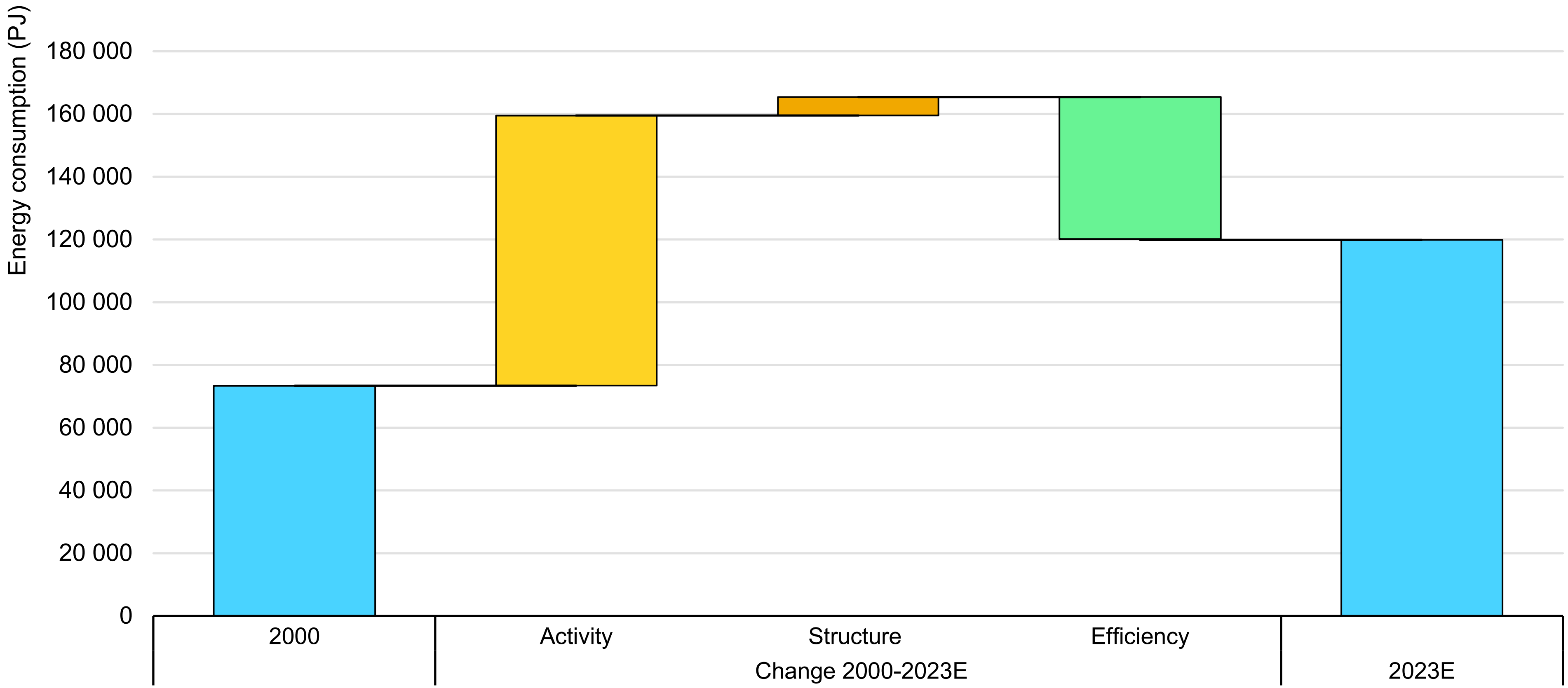
Progress in energy efficiency can also be observed in the manufacturing sector, the largest subsector of industry. In the European Union, for example, the manufacturing sector now produces 50% more value added using 25% less energy than two decades ago.

While the efficiency gains achieved at the national level are already significant, their combined effect across the G20 is even more substantial. Energy efficiency improvements in industry and services since 2000 have delivered cumulative savings of 46 EJ, equivalent to India's entire primary energy consumption. Two-thirds of these gains were achieved in China.

Looking at countries that have made significant progress in energy efficiency over the past decades, there is strong evidence of support through a diverse range of regulatory, incentive, and information policies. These include setting clear energy intensity targets, such as China's binding targets set through national five-year plans and Germany's regulatory targets under the Energy Efficiency Act, and providing financial incentives and technical assistance, such as Japan's energy management frameworks. Information initiatives, such as India's labelling scheme for industrial motors, also encourage improvements.

Since 2000, G20 countries doubled their economic output using just 60% more energy

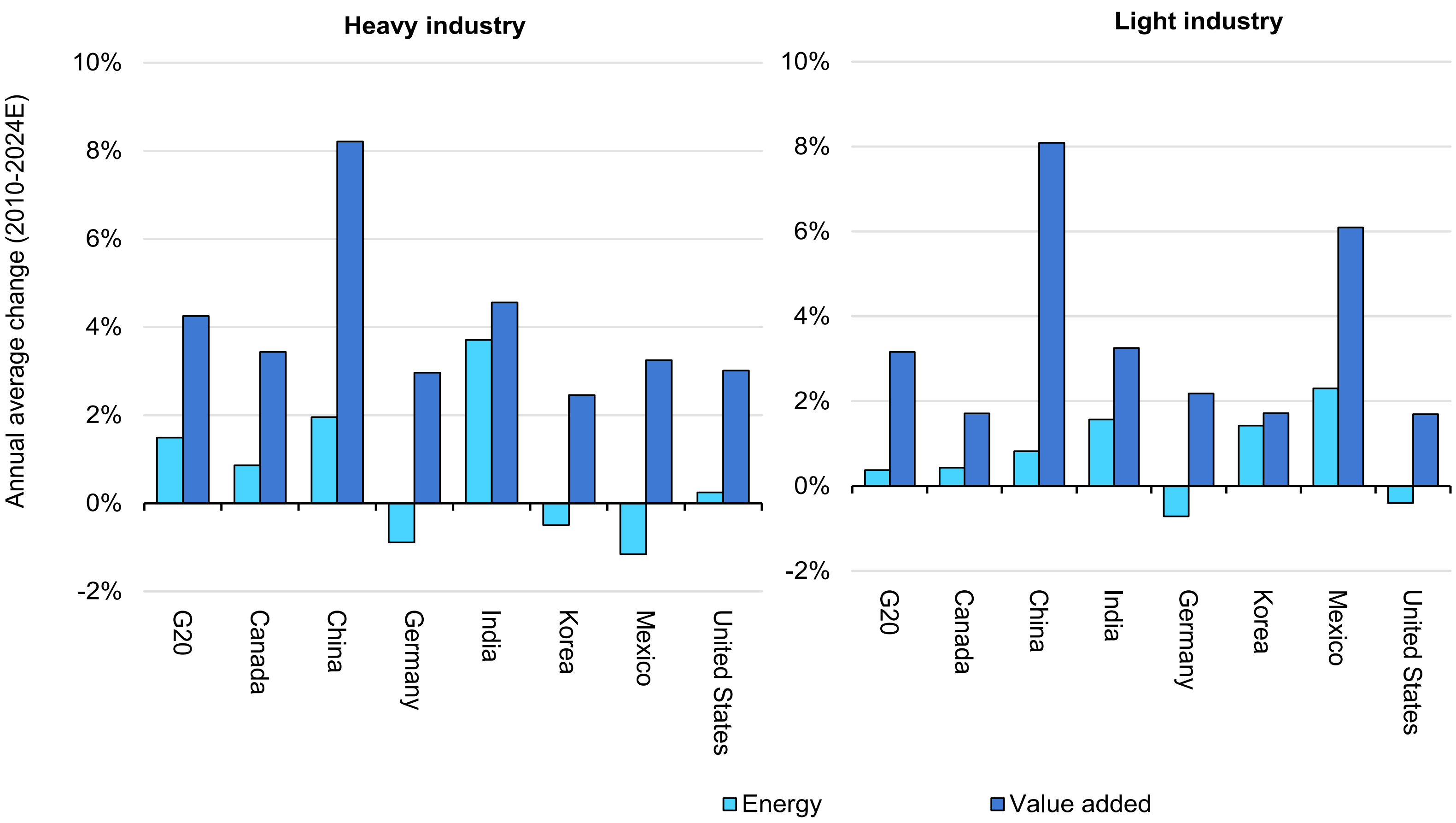
Decomposition of energy demand in industrial and services sectors, selected G20 countries



Notes: PJ = petajoule; 2023E assumes 1.8% 2022-23 industrial energy demand growth; data Includes all G20 countries except Argentina, the Russian Federation and Saudi Arabia.
Sources: IEA analysis based on IEA (2024), World Energy Balances; Oxford Economics (2025), Value added data.

Some countries need more than twice the energy of other countries to produce similar economic output

Industrial energy demand and value added, long-run average annual change, selected countries, 2010-2024e



Note: 2023-24E assumes 2010-22 average growth.
Sources: IEA analysis based on IEA (2024), World Energy Balances; UNIDO (2024) INDSTAT Revision 3..

Industrial energy demand has accelerated globally, while industrial efficiency progress has virtually flatlined

Driven by China and India, industrial energy demand has seen significant growth in recent years, increasing by 1.8% per year on average from 2019 to 2023, compared to 1.1% between 2010 and 2019. This has made the industrial sector the driving force behind the growth in global energy demand, accounting for 80% of the total increase in global final energy demand between 2019 and 2023, from around 430 EJ to 445 EJ. This came amid a surge in trading activity, with global merchandise exports growing by nearly 40% between 2020 and 2023.

At the same time, as detailed in the IEA Energy Efficiency Progress Tracker, industrial energy efficiency improvement has stalled.

Between 2010 and 2019, an annual energy intensity progress just below 2% was achieved in industry on average. But since 2019, this figure has fallen to an average improvement of around 0.2% per year – remaining largely unchanged. While this is in part due to a particularly weak year in 2020, when global industrial energy intensity actually increased by 2.4%, progress in industrial energy efficiency has yet to return to historical averages. In 2023 alone, industrial energy intensity improved by just under 0.5%, a virtual flatlining compared with the average of the previous decade.

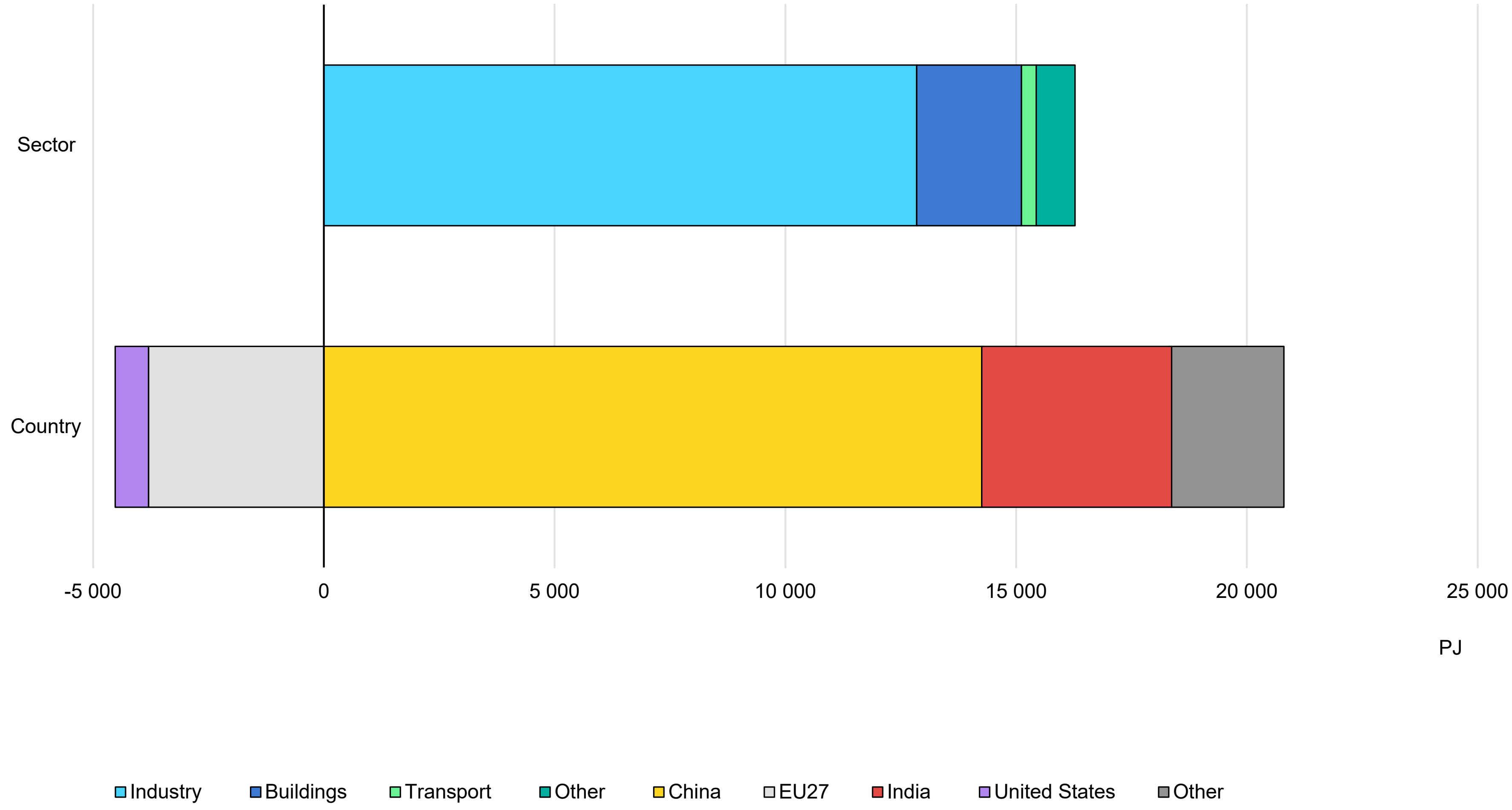
This stagnation in industrial energy efficiency is the main reason behind the recent slowdown in global energy efficiency progress more broadly. Since 2020, the average annual rate of progress in global energy intensity – for industry, transport and buildings combined – has fallen to around 1% per year, compared to around 2% per year between 2010 and 2019.

This slowdown has come at a time of increased policy ambition to work collectively to double the global average annual rate of energy efficiency improvements by 2030.

However, without a focus on improving progress in industrial energy efficiency, these trends risk weakening firms' competitiveness and adding pressure on energy systems, including electricity grids, that are straining to meet growing demand.

Industrial activity has driven 80% of the overall growth in final energy demand since 2019…

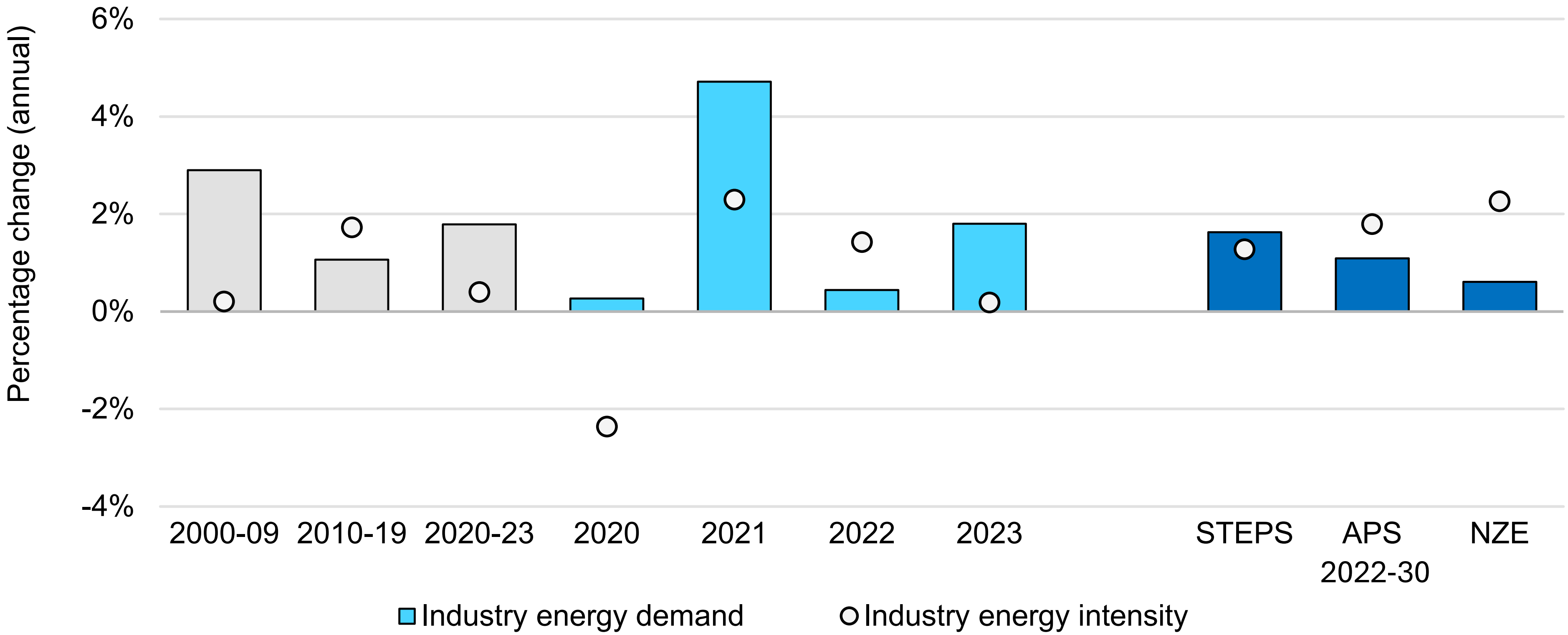
Drivers of growth in energy demand, World, 2019-2023



Sources: IEA analysis based on World Energy Outlook (2024), WEO Extended Data Tables.

…but a recent slowdown in progress on industrial efficiency risks weakening competitiveness

Industrial energy demand and energy intensity improvements, World, 2000-2023



Notes: STEPS = Stated Energy Policies Scenario; APS = Announced Policies Scenario; NZE = Net Zero Emissions by 2030 Scenario produced by the IEA. IEA scenarios are updated regularly to reflect the latest data, policy developments, and market trends. Scenario names and details may be subject to change.

Sources: IEA (2025), Energy Efficiency Progress Tracker; IEA (2024), World Energy Outlook.

Chapter 2. Unlocking the potential of energy efficiency

2.1. Efficiency opportunities at the firm level

At the firm level, energy efficiency offers untapped opportunities to reduce costs in both light and heavy industries

In a competitive environment, firms are seeking to reduce costs, support sustainable growth and meet dynamic market demands.

Energy is an important component of production costs in many industrial sectors, although its share varies by industry. These differences are influenced by the type and complexity of production. Heavy industries, such as steel, cement and chemicals, tend to be more energy intensive due to the large-scale processes and high thermal demands. Light industries, such as electronics and textiles, typically involve lower energy use per unit of output. Even within these broad categories, energy intensity – a measure of the energy required to produce a unit of economic output – also varies significantly. This reflects differences in technologies, operational practices and management approaches.

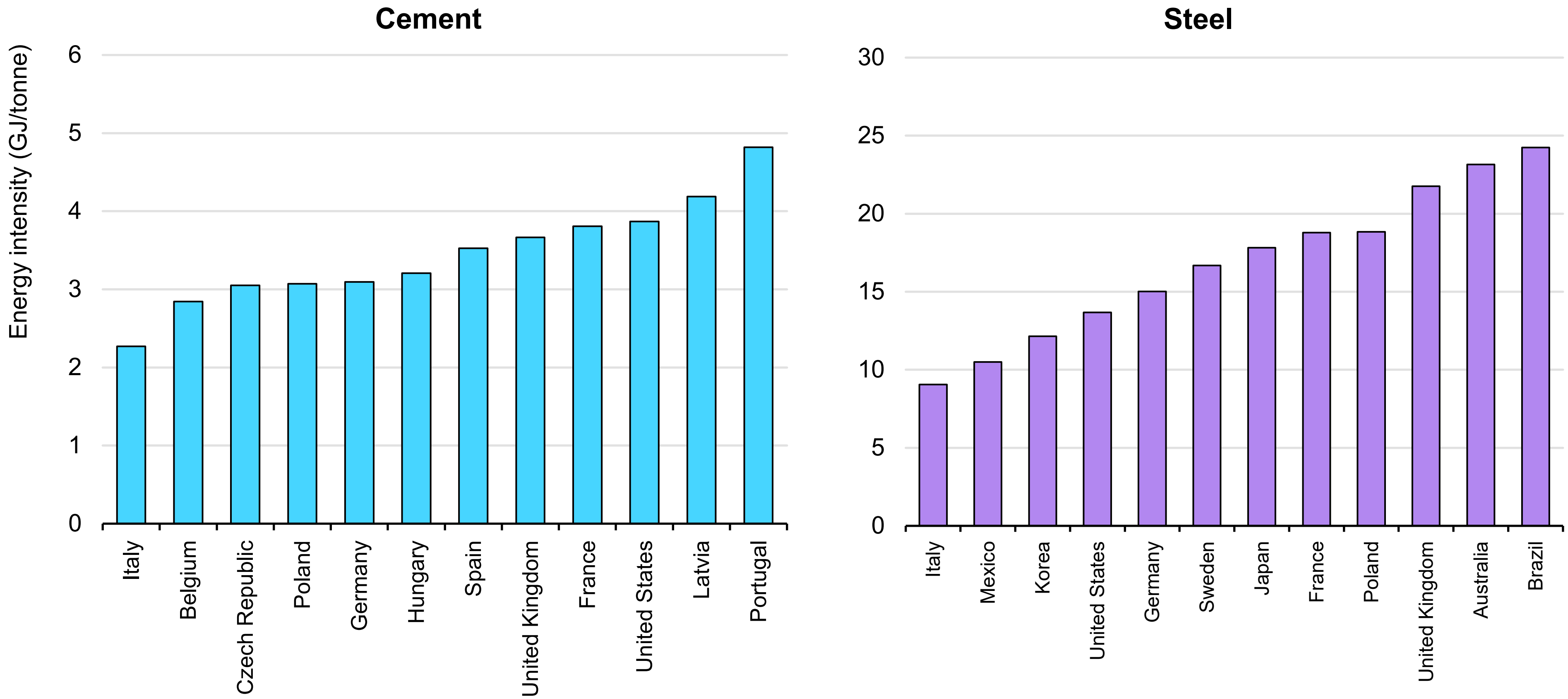
There are significant differences in energy intensity levels within the same industry across IEA countries. For example, the most efficient cement sector was 52% less energy intensive than the least. While industrial structures differ by country, considerable variation also exists at the facility level, even among sites producing the same or similar products. Benchmarking shows that energy intensity in electric arc furnace steel production can vary by up to 67%, and in ammonia production by 144%, within the same country. Firms with higher energy intensity may be incurring unnecessary costs, not only for energy, but also for raw materials, production processes, and waste management, which can all be improved with investments in efficiency.

An analysis of 10 000 industrial facilities in the United States shows that, adjusting for facility size and other factors, the energy required to produce the same sales volume varies significantly within the same subsector and to manufacture equivalent products. For example, energy consumption can vary by a factor of five times to manufacture plastic bags, and by a factor of seven times to produce bricks, with similar figures observed for other types of products, from milk to ceramic tiles to plastic bottles.

While some of these variations can be due to differences in products and other factors, such wide disparities highlight the potential for many firms to reduce energy expenditures through improved energy efficiency.

The energy required to make the same quantity of globally traded products varies significantly

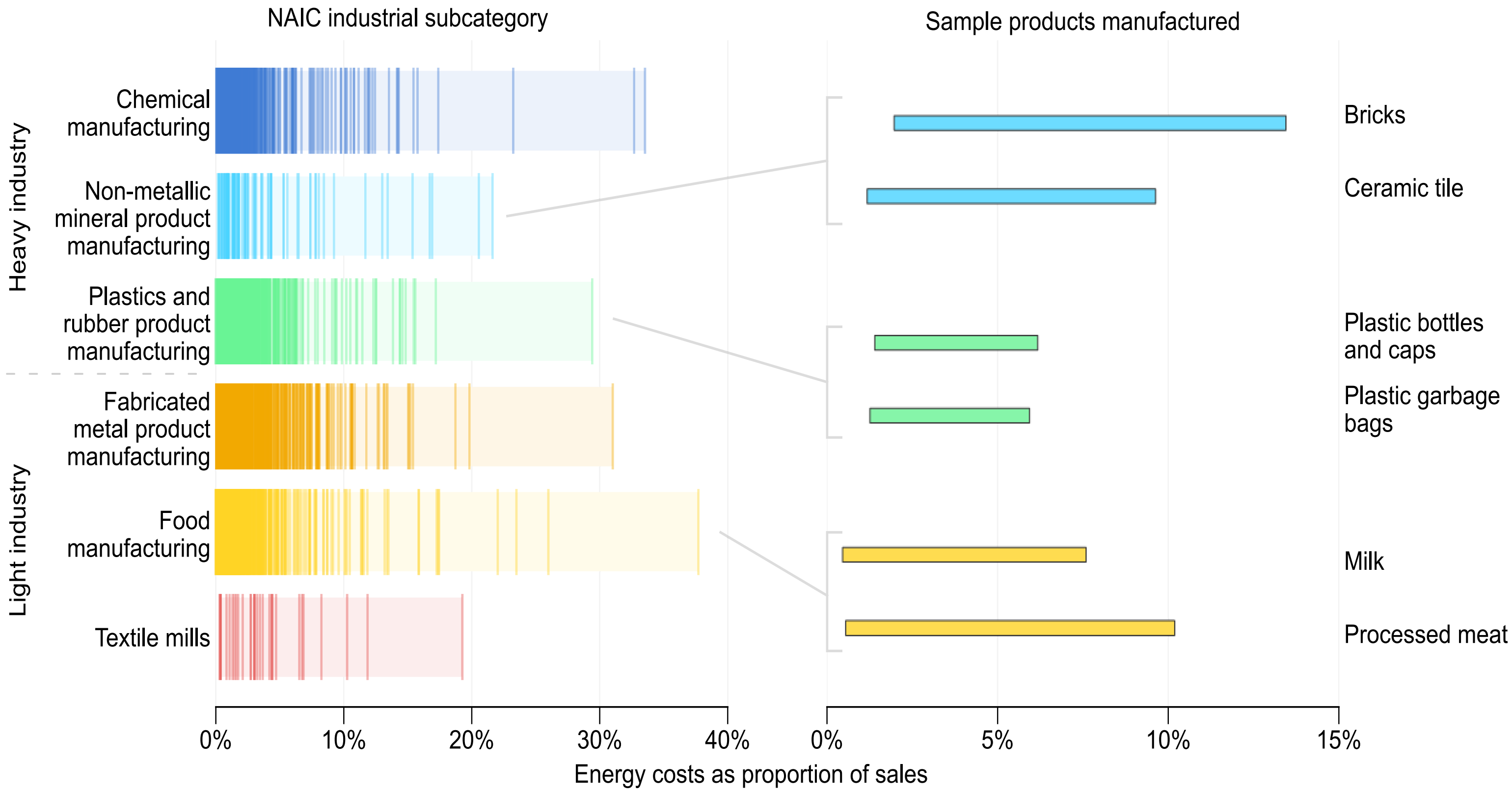
Energy intensity in the cement and steel sectors, selected countries, by latest year of data



Note: Latest year of data is 2022 for most countries listed.
Source: IEA (2025), Energy Efficiency Indicators.

For many products, wide variations in energy costs among competitors also highlight significant potential

Variation in the energy costs as proportion of sales for subsectors and products, United States, 2002-2024



Notes: Each vertical bar on the left represents an industrial facility of that industrial classification. Horizontal bars on the right represent the range between minimum and maximum ratios of the energy cost to sales for facilities making the same product within the same six-digit North American Industry Classification System (NAICS) code (bars show the 10^{th} to 90^{th} percentiles of energy costs.). Energy costs as a percentage of sales may also vary due to differences in product composition, specification, value, and other factors. Outliers are excluded based on the number of employees, facility area, and energy intensity.

Source: IEA analysis based on Industrial Assessment Centers (2002-2024), IAC Database.

In IEA countries, if all firms matched the energy consumption of the best performers in their subsectors, energy costs could be reduced by up to an estimated USD 600 billion

The potential for energy savings varies by sector, subsector and facility. From process optimisation to capital upgrades, industrial facilities can achieve significant energy savings across a range of investments. Firms that implement a culture of energy management (an approach explored in section 2.2) can uncover average savings of between 5% and 11% for heavy industry and between 10% and 18% in lighter industry in the early years of implementation, and cumulative savings of upwards of 40% to 60% over the longer term.

At the country level, these savings can add up to significant economic benefits. In IEA countries alone, if all firms matched the energy consumption of the 25% least energy-intensive firms in their respective subsectors, energy costs could be reduced by up to an estimated USD 600 billion. While not all firms can achieve the performance of the top 25% – variations in product composition, specifications and value can also influence energy performance – the magnitude highlights significant potential.

At the firm level, such savings can represent significant increases to the bottom line. For firms with higher energy costs and lower profit margins, such as iron and steel, building materials, and pulp and paper, saving 10% in energy is equivalent to the profit achieved with an increase of 4% to 16% in sales. Similarly, for an average small or medium-sized EU industrial firm with a profit margin of 10%, annual energy savings of EUR 5 000 would be equivalent to the profit made from EUR 50 000 in additional sales.

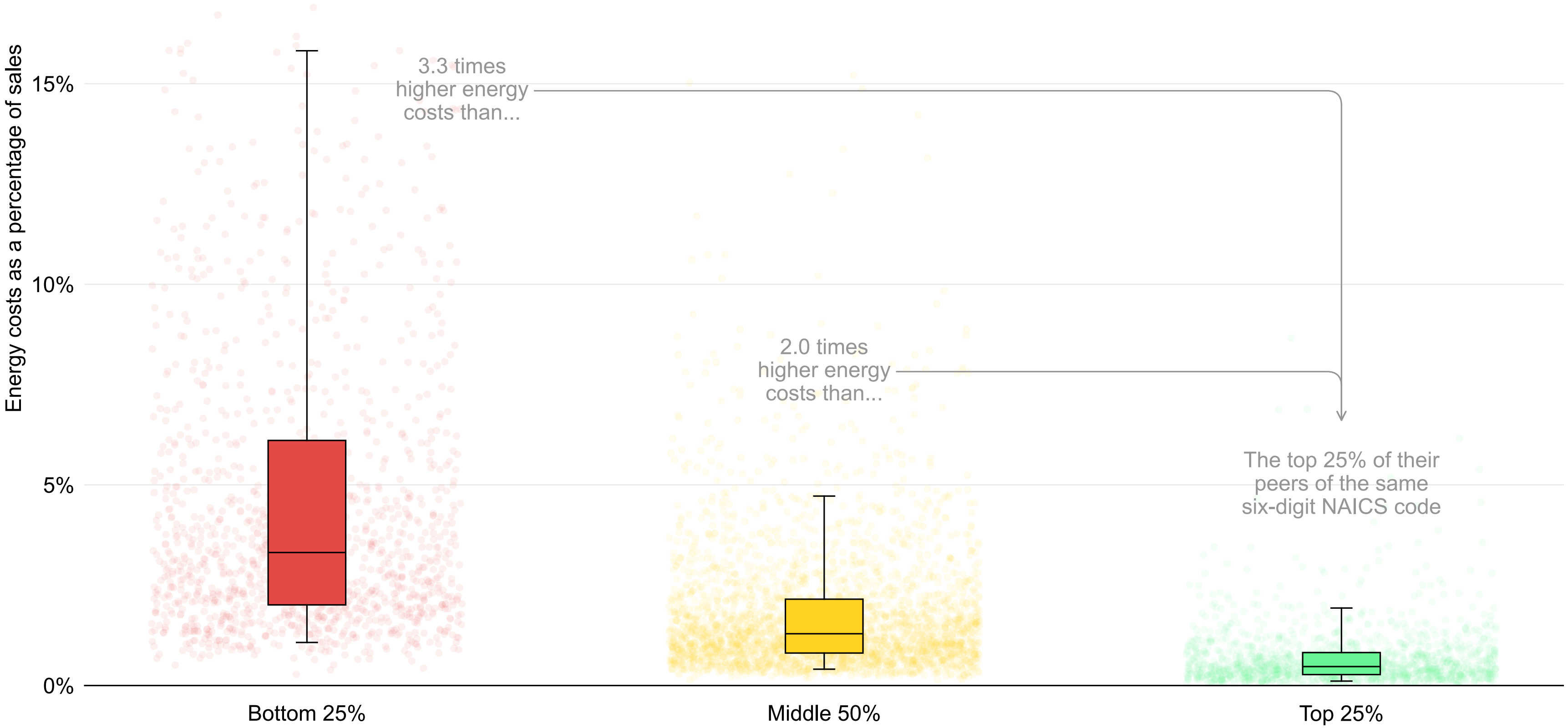
A 2025 survey of 1 000 industrial facilities around the world, prepared by the IEA, also confirms that firms are realising financial returns from investments in energy efficiency. About 70% of respondents reported a return on investment (ROI) of above 10% for the efficiency measures that they implemented over the last five years. These strong returns are not only reinforcing past investment decisions but are also shaping firms' views on the role of efficiency in enhancing competitiveness. Nearly 80% of respondents indicated that energy efficiency would provide a competitive advantage to their firm over the next five years.

Accordingly, many firms have made energy efficiency part of their strategic plans in an effort to improve their competitive position. For instance, the EP100 initiative brings together firms that have made public commitments to double their energy productivity or other energy efficiency related goals.

Despite this momentum, challenges remain. Upfront cost can be a significant barrier to implementing energy efficiency measures, especially for capital-intensive measures in heavier industry, which leads firms to often favour the most profitable measures with a shorter payback.

Within the same specific subsector, energy costs vary by three times across facilities on average for the same sales volume

Comparing energy costs for 10 000 facilities against peers with the same six-digit NAICS category, United States, 2002-2024

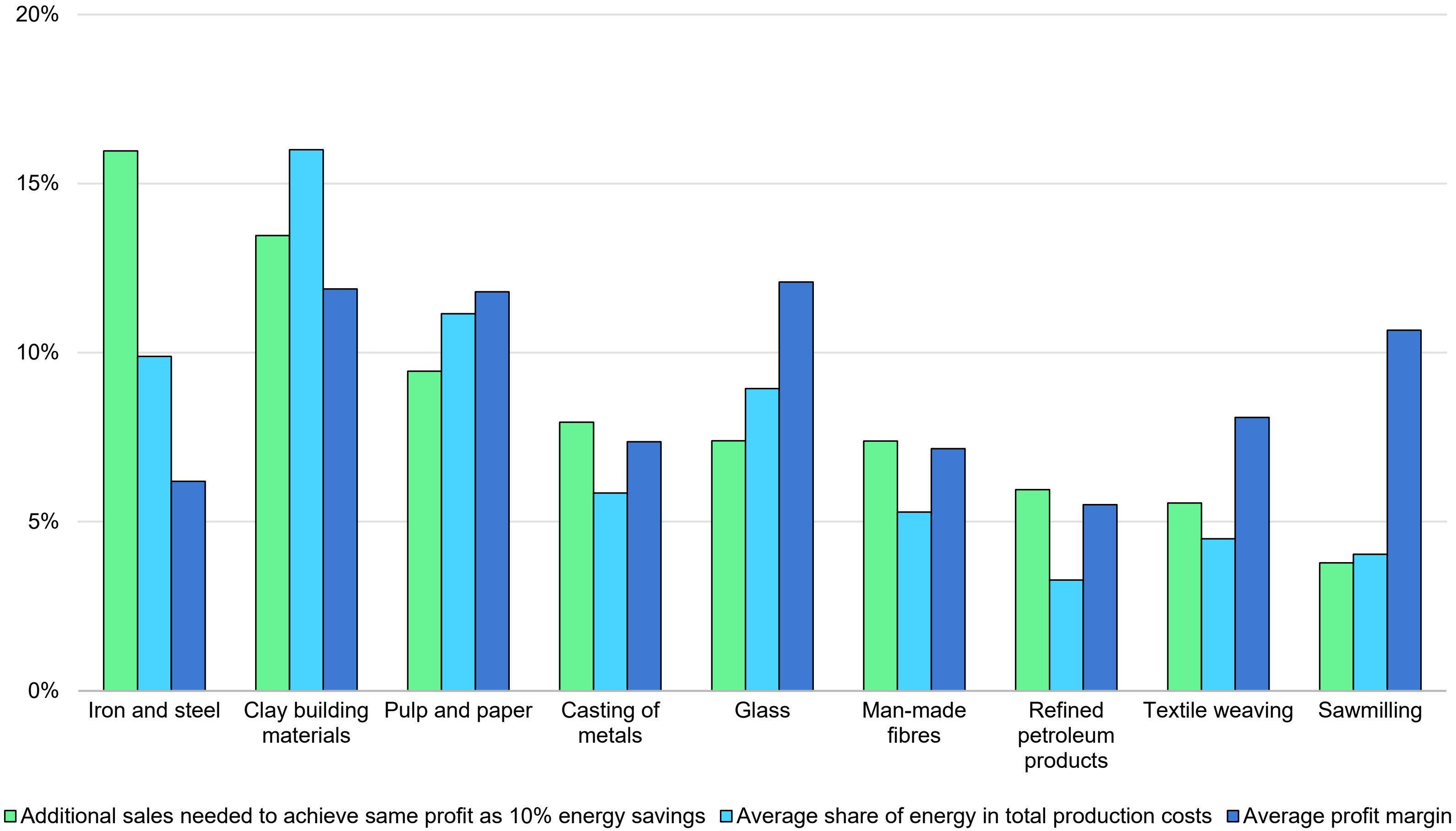


Notes: Facility outliers by are excluded based on employee count, facility area and energy intensity. Lines denote the 5th to 95th percentile, while bars show the 25th to 75th percentile. Bars present the average energy cost proportions for 100 different NAICS industrial classifications, grouped by their energy intensity percentile relative to the same six-digit industrial classifications. Energy costs as a percentage of sales may also vary due to differences in product composition, specification, value, and other factors.

Source: IEA analysis based on Industrial Assessment Centers (2002-2024), IAC Database.

For firms with high energy costs and thin profit margins, saving 10% in energy is equivalent to the profit achieved with a 4% to 16% increase in sales

Comparison of additional sales required to match costs savings through energy efficiency, EU countries, 2012-2022



Source: IEA analysis based on OECD (2025), Structural Business Statistics; European Commission (2024), Industrial Energy Costs Dashboard.

Beyond energy cost savings, energy efficiency provides multiple benefits that can enhance competitiveness

Investments in energy efficiency deliver multiple benefits that extend beyond energy cost savings, from increased energy security to lower emissions. At the industrial firm level, these benefits can translate into reduced costs and improved profitability and can also include:

- **Increased productivity**, such as higher equipment utilisation rates and increased production capacity, as a result of more efficient processes and lower production costs.
- **Improved resource use**, such as reduced equipment downtime and unplanned shutdowns, lower maintenance costs and potentially reduced staff requirements for operation and monitoring. For instance, a pilot assesment in European companies found that in nearly 40% of cases, companies implementing efficiency measures reported reduced unplanned downtime. Moreover, in an IEA survey of 1 000 firms, respondents estimated that 13% of unplanned downtime can be reduced as a result of energy efficiency measures.
- **Reduced waste production,** such as less use of raw materials and processing chemicals.

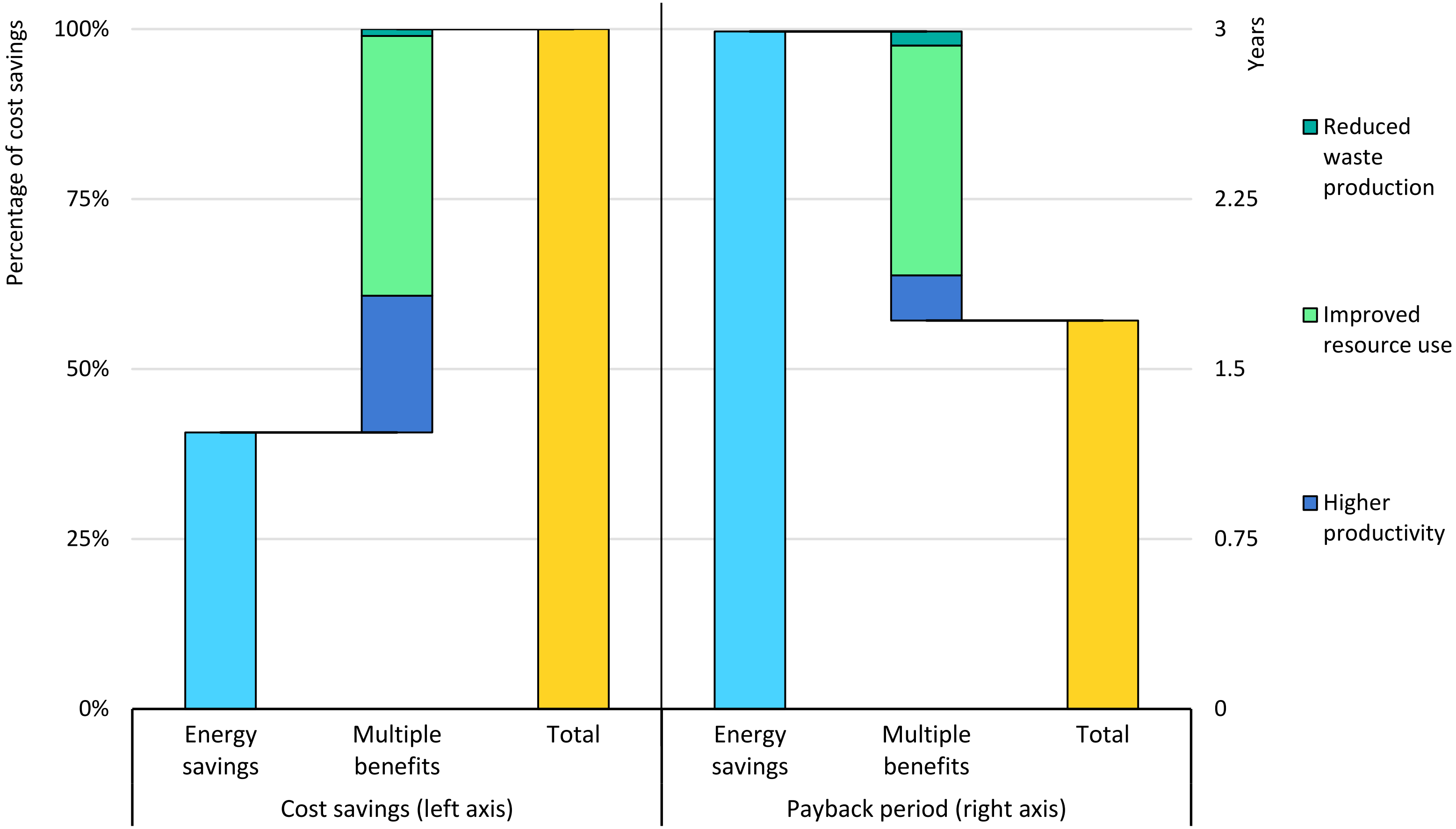
Efficiency has also been linked to improved labour benefits. A survey of over 15 000 European firms shows that energy efficiency investments were associated with labour productivity increases of between 1.4% and 3.6%. These benefits are often tied to improved indoor environments, such as better lighting, air quality and thermal comfort, which are linked to enhanced worker satisfaction and reduced absenteeism.

Case studies, such as those prepared by the Clean Energy Ministerial, showcase examples of firms that have recorded multiple benefits from the implementation of energy management measures, from a tyre manufacturer in India that recorded lower water consumption to a German polymer manufacturer that saw lower waste-disposal costs alongside energy cost savings.

For many firms, these broader benefits can outweigh the direct reduction on energy bills. An IEA analysis of 3 300 cases in small and medium-sized enterprises (SMEs) shows that when all benefits are included, total savings more than double. Across a range of studies, the value of efficiency was shown to increase by 40% to 250% when including the multiple benefits beyond energy savings.

Every dollar saved on energy efficiency improvements can deliver over a dollar in wider benefits

Average cost savings and payback periods of 3 300 energy efficiency measures in SMEs, United States, 2002-2024



Source: IEA analysis based on Industrial Assessment Centers (2002-2024), IAC Database..

2.2. Efficiency in action

As a start, firms can achieve "quick wins" with payback periods of less than two years

Firms face various economic, institutional and informational barriers to the implementation of energy efficiency measures. These include limited access to financing, long payback periods for certain measures and lack of clear information about energy consumption. However, firms can start to reap the competitiveness benefits of energy efficiency with a series of "quick wins".

Quick wins are easy-to-implement measures that can provide significant savings while avoiding the most common barriers. They typically have low upfront costs and require limited intervention, which can translate into payback periods of less than two years, reduced risks and more easily perceived benefits.

A key way to find potential quick wins is to conduct an energy audit or review to understand how energy is being used and to identify quick fixes, which can include both maintenance activities and replacing equipment. A complementary nighttime audit can also reveal energy consumption unrelated to the production process.

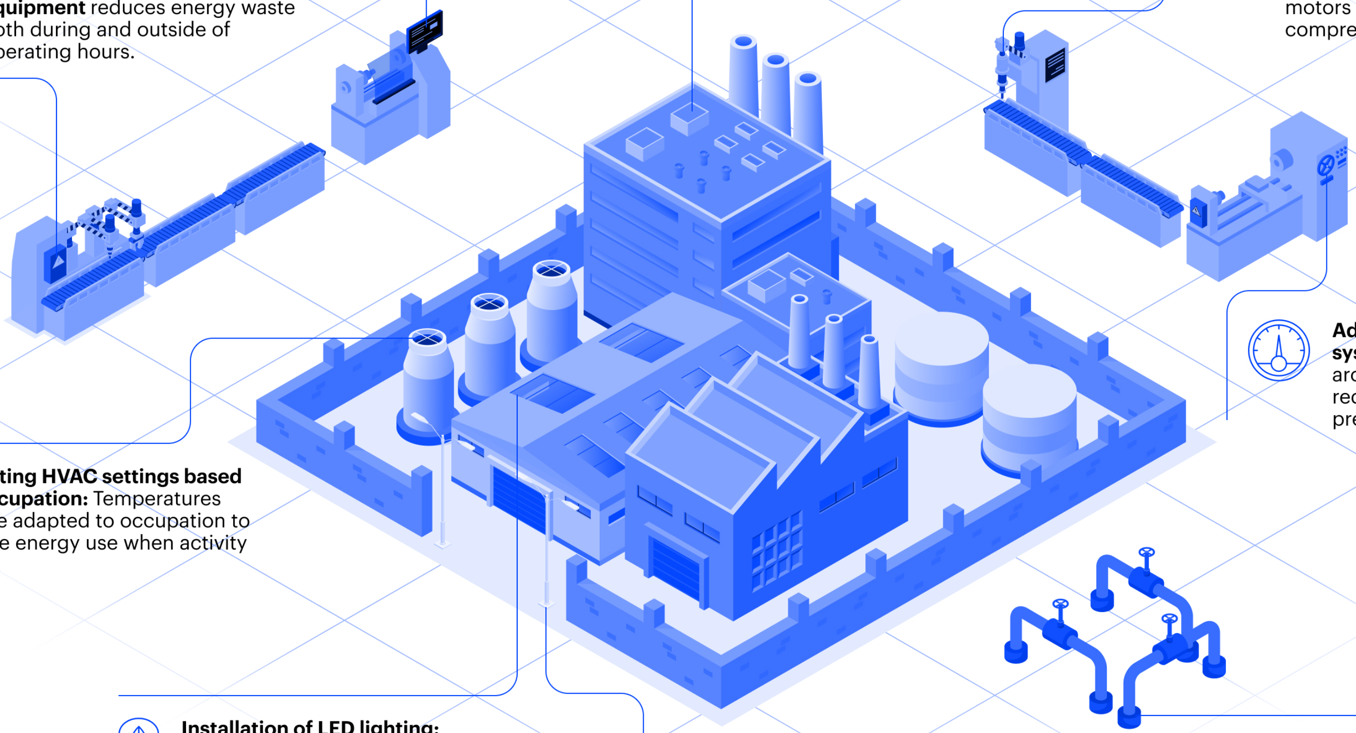
A set of quick wins that apply to most industrial facilities can include:

- regulation of heating, ventilation and air conditioning (HVAC)
- reduction of losses in compressed air systems
- automation and sectorisation of lighting systems
- power management of equipment
- repair and maintenance of insulation materials
- right-sizing and linking assets to match load
- installation of light-emitting diode (LED) lighting systems
- replacement of aged motors with high-efficiency models
- implementation of variable speed drives for motors
- encouraging behavioural changes, such as switching off equipment when not in use

Although they are simple to implement, these measures can deliver wide-ranging benefits. High efficiency LED lighting can reduce energy consumption by 90%, while extending product lifespan. In motor systems, particulary for low-efficiency models, lifetime energy costs often far exceed the initial investment. In such cases, efficiency improvements can yield returns up to seven times the capital cost. Replacing conventional boilers with heat pumps can improve efficiency by a factor of four, while also reducing reliance on fossil fuels. Even very low-cost actions, such as correct compressor loads, can reduce energy consumption in compressed air systems by more than one-third. Similarly, better maintenance scheduling can help reduce unplanned downtime.

Some of these quick-win measures can be found in the majority of facilities, especially in smaller organisations. An analysis of industrial firms in the United States found that more than 70% of facilities could implement quick-win upgrades to lighting and air compressors, and that around 45% of facilties have the potential to achieve savings through upgrades to motors.

A closer look at "quick wins"



Power management of equipment reduces energy waste both during and outside of operating hours.

Replacement of aged motors with high-efficiency models: Best-in-class motors can be up to 15% more efficient than those in use.

Regulation of heating and cooling temperatures: Adjusting the thermostat by 1°C can reduce energy consumption by around 7%.

Installation of variable speed drives for motors: Savings can be between 10% and 75% for motors driving pumps, compressors and fans.

Adjusting air compressor system pressure: Savings of around 7% can be obtained by reducing 1 bar in system pressure.

Adjusting HVAC settings based on occupation: Temperatures can be adapted to occupation to reduce energy use when activity is low.

Installation of LED lighting: LEDs use 90% less energy than incandescent bulbs and have longer lifetimes.

Automation and sectorisation of lighting systems optimises the use of energy with almost no investment costs.

Reduction of losses in compressed air systems: Up to half of the energy consumption can be due to system losses.

Deeper upgrades can double the rate of savings of “quick wins”

Implementing quick wins is the easiest and fastest way to improve a facility’s energy efficiency. Achieving maximum improvements, however, requires more ambition.

Deeper upgrades entail more significant, longer-term changes to equipment or processes and deliver more substantial improvements to energy and process efficiency. While quick wins can be enabled through easy-to-implement changes like adjusting existing controls or maintenance scheduling, deeper upgrades generally require investment in newer equipment and adjustments to production processes. Examples include:

- reusing waste heat from operations
- redesigning processes to reduce energy use and/or production line bottlenecks
- advanced automation and controls to optimise energy use
- building insulation and fabric improvements
- closed-cycle water usage
- installing thermal energy storage systems
- integrating energy flows via sector coupling

While initial investment costs and payback periods vary depending on project complexity, the magnitude of savings can be significant.

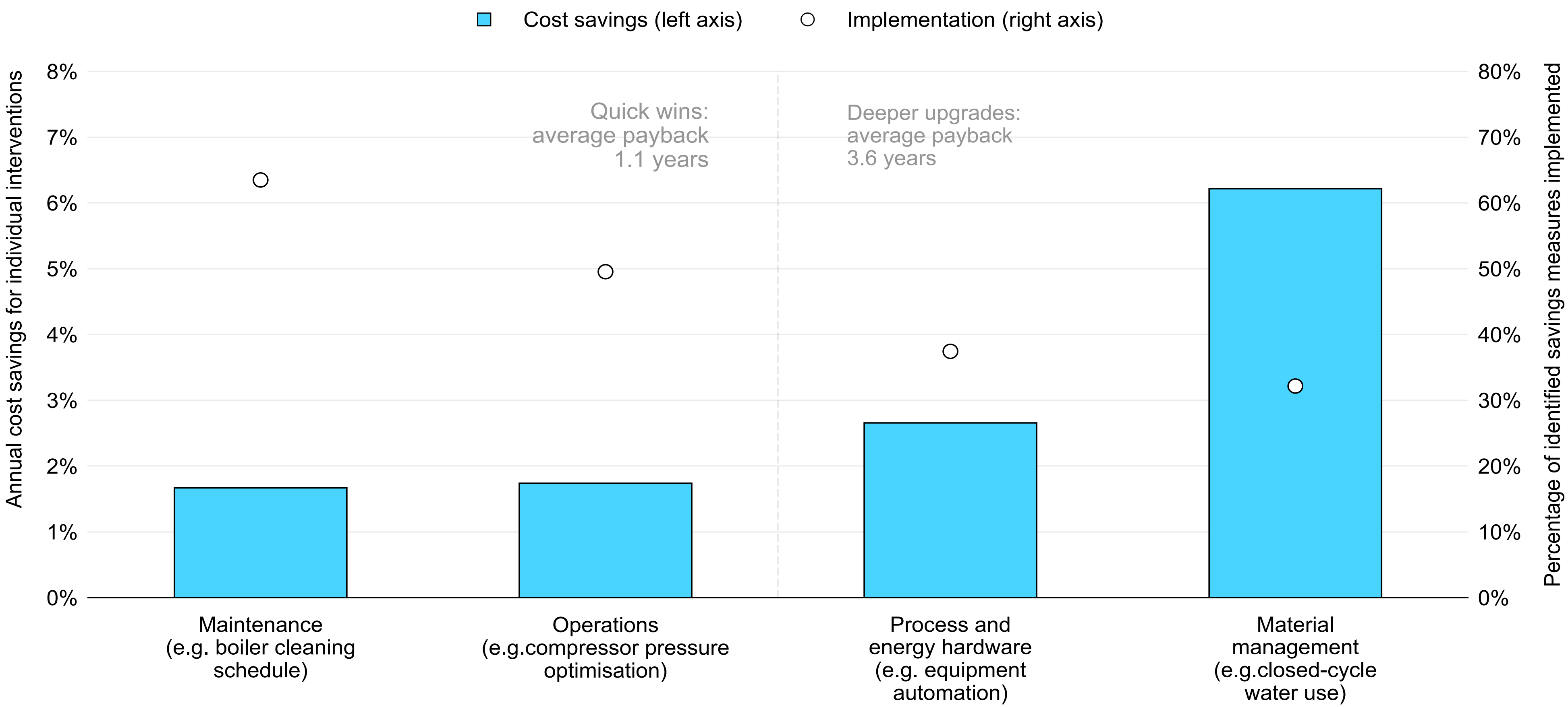
An analysis of a broad set of industrial energy efficiency measures indicates that quick-win interventions delivered average cost savings of around 2% per measure. In comparison, deeper system upgrades achieved average savings of 5% per measure. Another study found that, while there were notable gains to be made from optimising the motor alone, upgrading the entire motor system resulted in savings that were 50% higher. Meanwhile, industrial heat pumps can reduce energy use of process heat by more than 30% in some cases.

Despite their higher potential, deeper upgrades face greater barriers to implementation. In the United States, quick-win measures were implemented in around half of the observed cases. However, only a third of deeper upgrade opportunities were pursued, despite the higher potential for cost savings. Factors such as higher upfront costs, additional complexity and modification of existing production processes can all be additional barriers.

Targeted policy support, as outlined in Chapter 4, is essential to accelerate uptake, especially for capital-intensive measures. Linking such policies to clear energy efficiency targets and robust tracking mechanisms can help ensure higher efficiency gains.

Deeper facility upgrades can deliver greater savings but are implemented only half as often

Payback period, savings and implementation of 55 000 individual energy efficiency measures grouped into major types of intervention, United States, 2002-2024



Source: IEA analysis based on Industrial Assessment Centers (2002-2024), IAC Database.

Box 2.1: Motors account for most industrial electricity demand and offer significant room for improvement

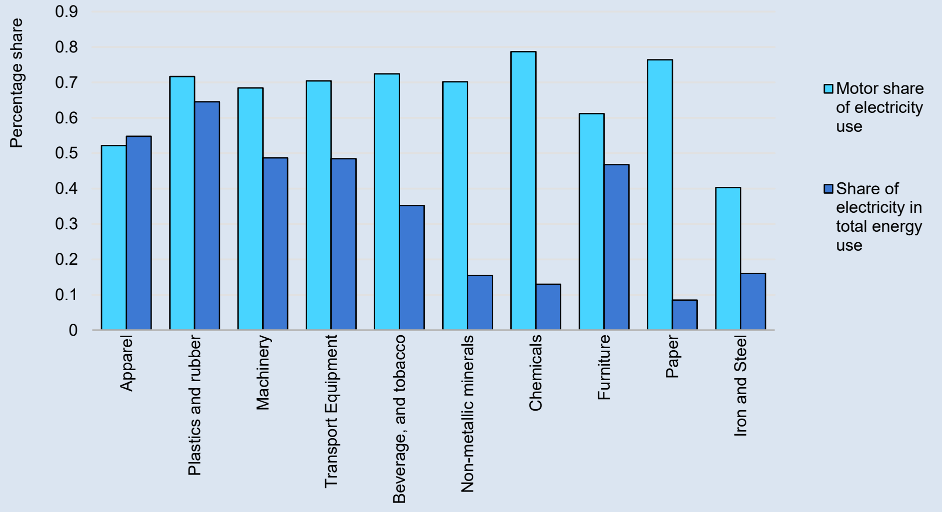
Around 70% of the total electricity consumed by the industrial sector is used in electric motor systems. Over the past decade, electric motor technology has advanced rapidly, offering new opportunities for energy savings.

Today, a broad range of highly energy-efficient motors are widely available and cost-effective over their lifetime. For example, a motor rated at the IE3 international standard level can reach up to 96% efficiency, and even higher performance is achievable with IE4 and ultra-premium models. Yet many existing systems continue to rely on IE1 or IE2 motors which, with an efficiency as low as 85%, can waste two to three times more energy.

The scale of opportunity is significant. Approximately 75% of industrial motors are used to power pumps, fans and compressors, which are particularly well suited for efficiency upgrades. In pumping systems, for example, efficient motors with adjustable speed operations can deliver the same output while using only one-third of the electricity of conventional setups.

Despite this opportunity, only 45 countries have implemented mandatory energy performance standards for motors at the IE3 level or higher.

Share of electricity demand in industry sector, United States, 2021



Source: IEA analysis based on Lawrence Berkeley National Laboratory (2021), U.S. Industrial and Commercial Motor System Market Assessment Report Volume 1: Characteristics of the Installed Base .

A culture of energy management can unlock continuous energy savings, year after year

Energy management – a well-recognised strategic approach of adjusting and optimising energy consumption – is a key lever for industrial competitiveness. By embedding a culture of continuous improvement and securing strong management commitment, companies can reduce costs and improve resilience.

This strategic approach applies across both light and heavy industry and follows repeating cycles of key steps: quantifying energy demand and setting strategic goals, implementing targeted measures, and tracking progress through ongoing monitoring and benchmarking.

The ISO 50001 standard and certification provides an internationally recognised framework for such systems, but other flexible approaches also exist, such as the 50001 Ready programmes available in Canada, Saudi Arabia and the United States, that support ongoing energy management without requiring full certification.

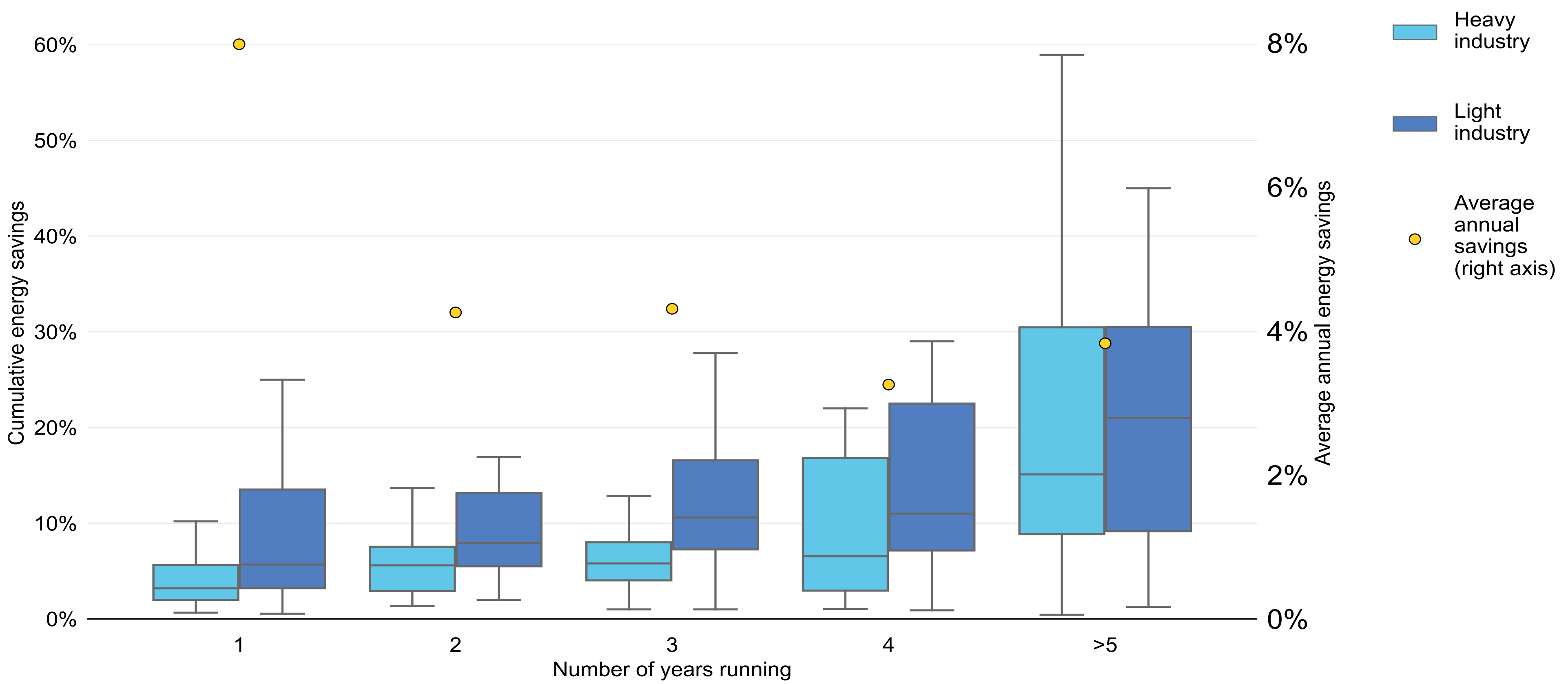
The implementation of energy management systems can lead to significant savings. In the first three years of ISO 50001 adoption, companies report average savings of 11%. Across light and heavy industry, firms implementing ISO 50001 achieve consistent energy savings, averaging 4% annually every subsequent year. Over time, these gains can compound to deliver major performance improvements. An analysis of energy management systems in Italy shows a growing number of firms reporting energy savings over time. In 2021, around half of firms reported savings of 4% to 10%, up from less than one-third in 2016. Light industry often sees faster and more cost effective improvements, while heavy industry benefits from greater absolute savings.

Case studies from the Clean Energy Ministerial's Energy Management Working Group illustrate how long-term commitment to energy management has yielded substantial results around the world. For instance, over nine years, an Irish food manufacturing facility improved its energy efficiency by 45%, while an Indonesian sports footwear manufacturer cut its energy demand by 37.5%. A Chinese firm making household electrical appliances achieved a 43% energy efficiency improvement over five years.

Firms that achieve the greatest efficiency improvements are typically those that have embedded energy management as a core element of their business strategy. For these companies, energy efficiency is recognised not only as a tool for reducing consumption, but also as a driver of continuous improvement and other benefits.

Over the longer term, energy management systems can lead to cumulative energy savings as high as 60%

Energy savings by facilities implementing ISO 50001, international, 2016-2024



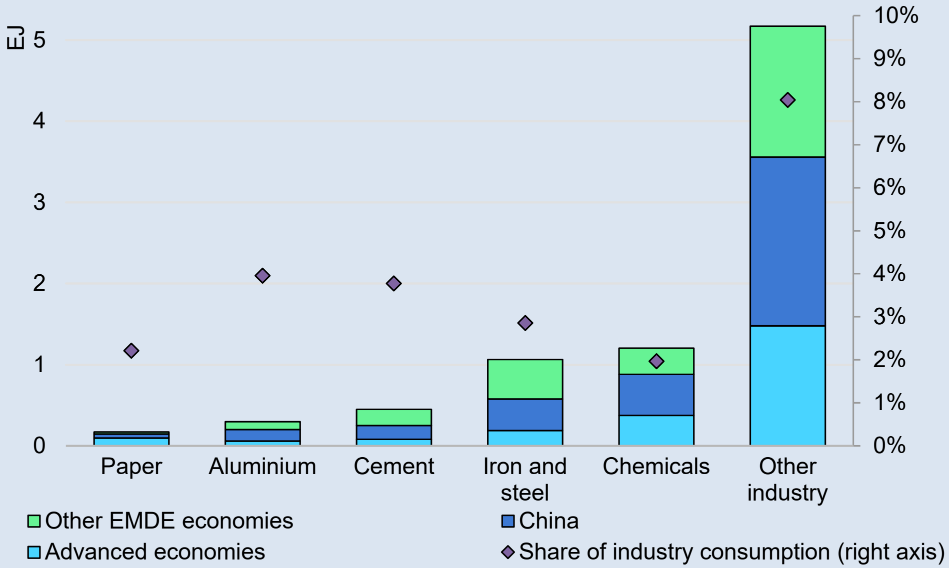
Note: Lines denote the 5th to 95th percentiles, while boxes show the 25th to 75th percentiles.
Source: IEA analysis based on Clean Energy Ministerial (2024), Energy Management Leadership Awards.

Box 2.2: AI is emerging as a significant enabler of improved energy and operational performance, especially in light industry

While the use of artificial intelligence (AI) today remains concentrated among larger firms and in certain sectors, it has the potential to play a broader role in strengthening competitiveness. In industry, AI applications such as quality control, predictive maintenance, generative design, digital twins, and intelligent robots are primarily implemented to reduce costs, while also improving operational efficiency and product outcomes. By analysing operational data in real time, AI systems can identify inefficiencies that would otherwise go undetected, enabling continual adjustment and fine-tuning of industrial processes. Predictive maintenance, supported by AI-based monitoring, can prevent energy and material losses associated with equipment degradation. The potential scale of impact is significant. Widespread adoption of AI across industrial sectors could reduce global industrial energy consumption by as much as 8 EJ by 2035, an amount equivalent to Mexico's current total energy use. Documented case studies based on existing AI use cases in the steel and cement industries, among others, have demonstrated energy savings in the range of 2% to 6% through the application of AI technologies to optimise production processes. In sectors where energy costs constitute a large proportion of production costs, such efficiency improvements could provide an important competitive advantage.

Policy and regulatory frameworks that facilitate participation in flexibility markets, recognise the value of flexible operations and encourage digitalisation and AI adoption can further enhance the competitiveness of industrial actors

Energy savings in the Widespread Adoption Case from optimising production processes of electricity demand in industry sector, 2035



Source: IEA (2025), Energy and AI.

2.3. What firms are saying

Industry leaders report competitiveness benefits and barriers to action on efficiency

In 2025, the IEA carried out a survey of 1 000 industrial firms across 14 countries to find out more about private sector perspectives on the role of efficiency in competitiveness. Around 80% of firms indicated that energy efficiency is key to maintaining their competitive edge. Respondents reported that more efficient energy practices led to a broad range of benefits, including reduced maintenance, operational costs and unplanned downtime. Nearly 40% of respondents indicated that energy efficiency is their first line of action against rising energy costs.

Challenges remain, especially for smaller organisations. Less than a third of the companies in that survey had carried out an energy audit in the past five years. For companies with fewer than 100 employees, only 15% had carried out an energy audit in the last five years, and 17% had not implemented any major energy efficiency measures in that same period. Several persistent barriers can hinder implementation:

Upfront cost barriers: In a 2024 survey of over 1 200 companies committed to energy efficiency, more than half of the respondents identified upfront costs as the biggest barrier to implementing energy efficiency improvements. In the United Kingdom, a survey of manufacturing firms showed that funding access was twice as likely to be a barrier for SMEs than for large companies. Addressing this barrier requires targeted financing instruments, such as energy performance contracts and green loans with lower risk premiums, and easily accessible information on existing financial supports. It can also be helpful to tailor policies to address the limited capacity of SMEs, as in Japan and the Netherlands where governments have established dedicated SME energy efficiency programs that offer technical assistance and simplified access to funding.

Information barriers: Firms report that a lack of data to make the business case or lack of understanding of available options can be significant barriers to action. Policy makers can help close this gap by supporting the development and adaptation of benchmarking frameworks and standards, such as the Top Runner Programme and best available technologies (BATs), which demonstrate the most efficient technologies for different processes.

Skills barriers: As firms invest in energy efficiency improvements, it will be essential to find qualified workers to install and maintain equipment and systems. However, firms may face challenges due to skills shortages in key energy efficiency occupations, such as electricians and installers of HVAC and heat pumps. The 2024 survey of companies committed to energy efficiency revealed that 30% of businesses identified a lack of digital skills in their workforce as a barrier to enhancing energy efficiency, and 25% of businesses also perceived workforce resistance to new technology as an obstacle. An integrated policy approach, as explored in Chapter 4, can help overcome these barriers.

What competitiveness benefits do industry leaders report?

64%

of firms with **over USD 1 billion** in annual turnover reported that their energy efficiency efforts have **enhanced their competitiveness**.

60%

of large enterprises (500+ employees) stated that energy efficiency measures have had a strong impact on **reducing maintenance and operational costs.**

39%

of surveyed firms indicated that energy efficiency is their **first line of action** to manage **rising energy costs.**

51%

of respondents said their energy efficiency investments have increased **digital skill requirements** within their workforce.

43%

of respondents believe that energy efficiency has a high impact on **growth in export markets or international sale.**

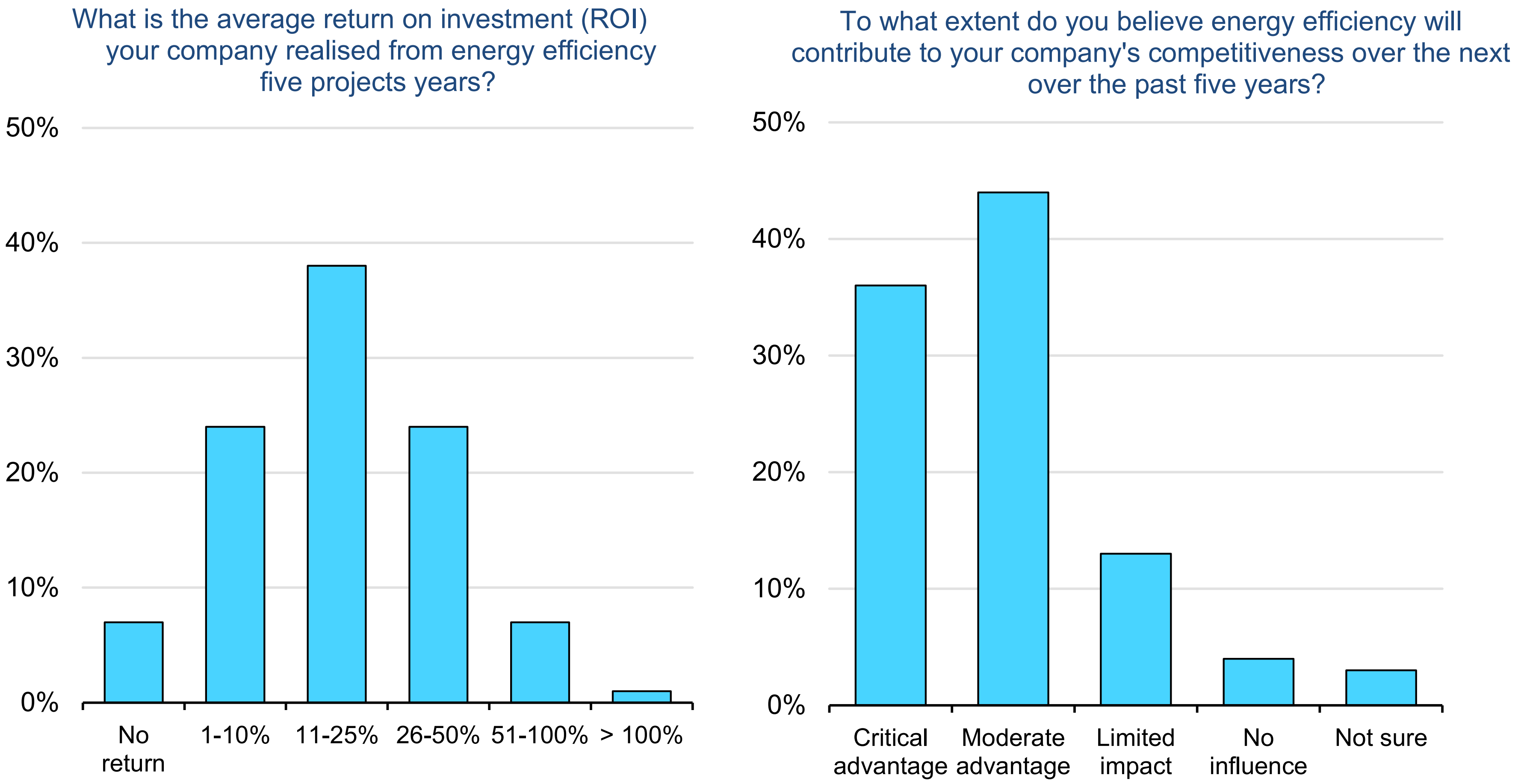
13%

of unplanned downtime, on average, could be reduced at the firm level by implementing energy efficiency improvements, according to respondents.

Note: IEA Industrial Competitiveness (survey), 1 000 respondents (2025).

Firms report double-digit ROI for recent energy efficiency investments and expect energy efficiency to create competitive advantages for them in the coming years

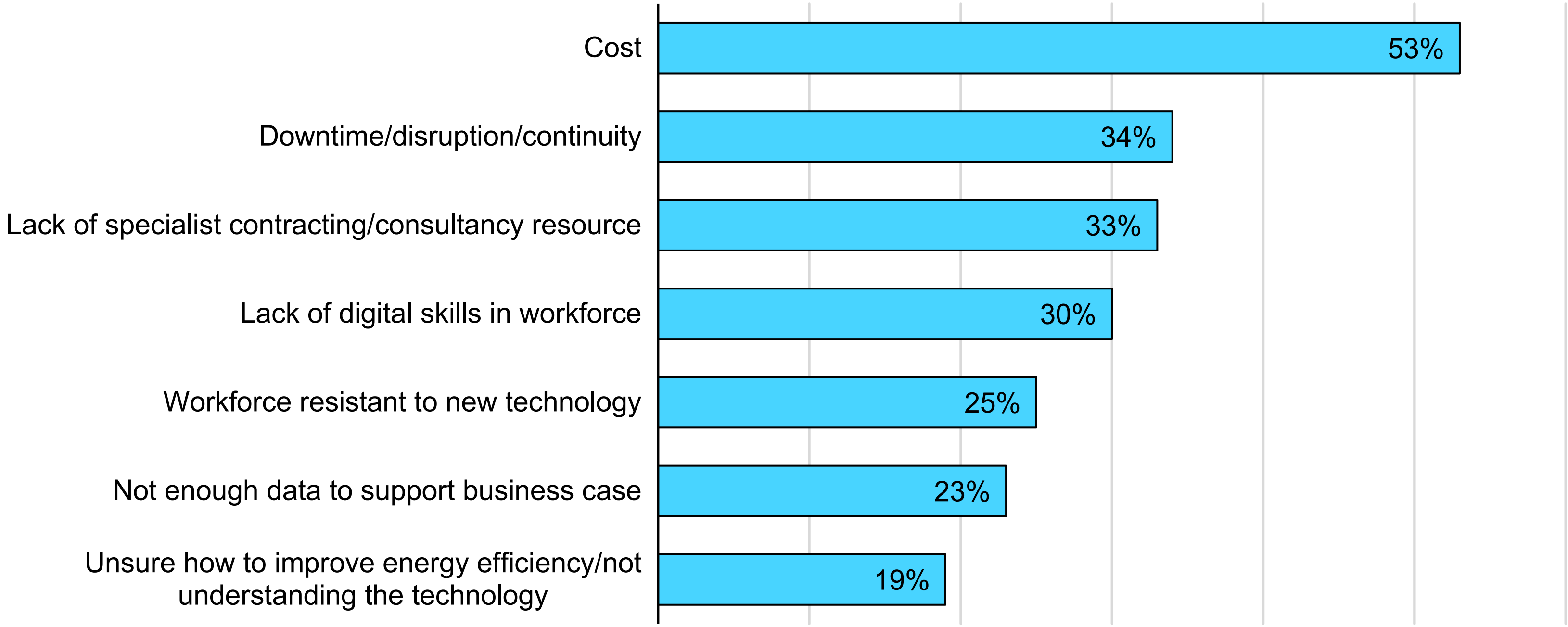
IEA survey results on industrial competitiveness, 1 000 respondents, 2025



Note: IEA Industrial Competitiveness (survey), 1 000 respondents (2025).

Upfront cost remains the top barrier to energy efficiency, but workforce challenges underscore the critical role of training and awareness

Barriers to energy efficiency, survey of over 1 200 companies, 2024



Source: Energy Efficiency Movement (2024), From Insight to Implementation: Business Perspectives on Energy Efficiency Investments, Energy Efficiency Investment Survey.

Chapter 3.
Opportunities in efficiency markets

As market demand grows, the manufacturing of energy efficiency technologies represents a new opportunity

Facing volatile energy prices, rising energy security risks and stricter regulations, all sectors are turning to energy efficiency technologies to reduce consumption and manage these growing challenges. At the same time, governments around the world committed at COP28 in Dubai in 2023 to work collectively to double the global average annual rate of energy efficiency improvements.

These dynamics have triggered a strong increase in demand for energy efficiency technologies. For example, the market for electric vehicles (EVs) and batteries has grown nearly six-fold from 2020 to 2023, while heat pump markets grew by 36% in the same timeframe. This momentum continued in 2024 with global electric car sales exceeding 17 million. In 2025, sales are expected to surpass 20 milion, accounting for more than one-quarter of cars sold worldwide. Correspondingly, the demand for EV batteries expanded to over 950 GWh in 2024.

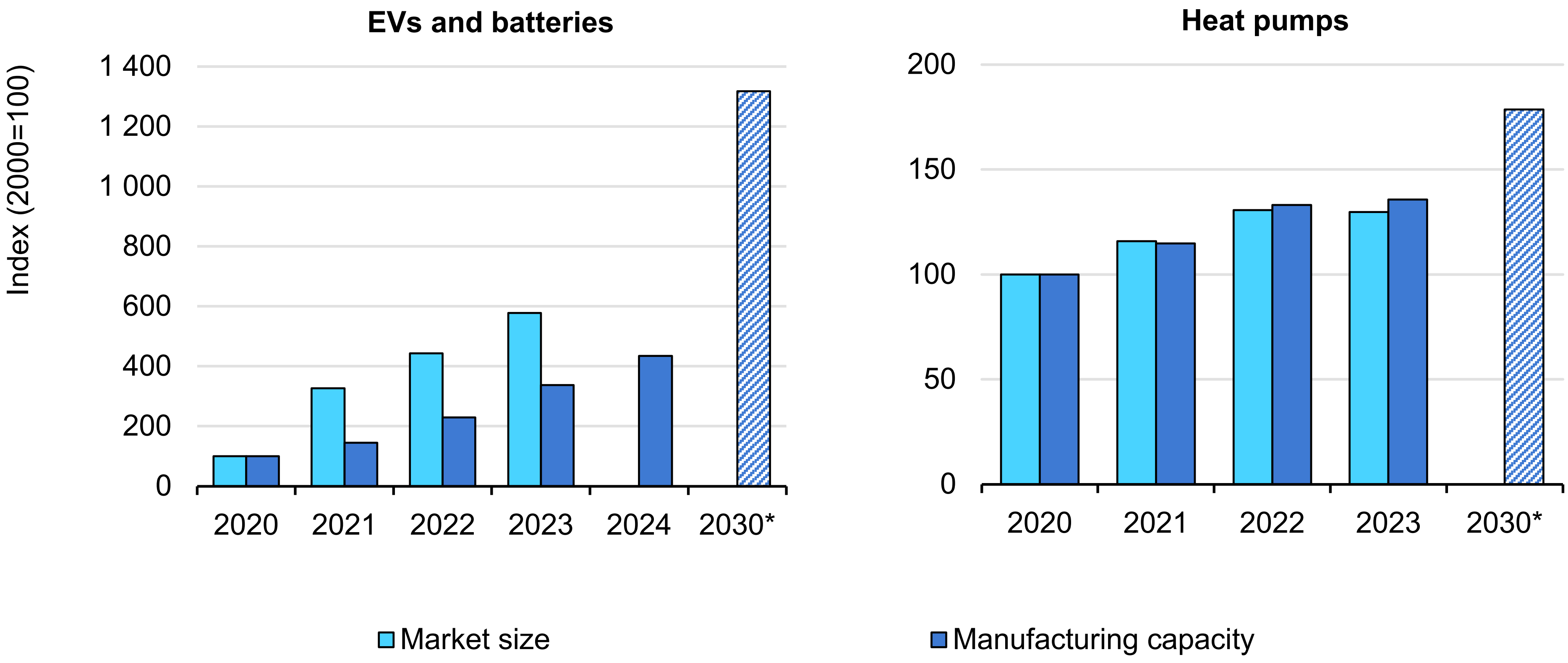
This has led firms to react and to expand production capacity to meet the demand. Production capacity for battery cells increased more than four-fold from 2020 to 2024, while for heat pumps it increased by 35% until 2023. Committed projects – i.e. those that are either under construction or have reached a final investment decision – will double battery cell production capacity again by 2030. When considering all announcements on capacity additions, they are even expected to triple by that time.

Other energy efficiency technologies also show similar market expansion. Heat pump production capacity is expected to add another 32% by 2030 based on committed and preliminary forecasts. Meanwhile, building insulation has seen strong growth in recent years driven by stricter energy performance regulations and rising energy costs, and is expected to maintain this momentum. In the EU alone, driven by the Fit for 55 package and the Renovation Wave strategy, the insulation sector could reach around USD 175 billion by 2030, creating approximately 1.5 million jobs.

Similarly, electric motors, a component present in a large number of technologies, have also shown remarkable growth. The global electric motor market grew significantly between 2020 and 2024, reaching a value of USD 145 billion in 2024. While the overall sector expanded steadily, some companies more than doubled their revenue over the same period.

Manufacturing capacity for energy efficiency technologies is increasing rapidly

Global market size and manufacturing capacity for EVs and batteries and heat pumps, Index



* Denotes announced production capacities for 2030. Heat pump manufacturing capacity for 2030 includes committed capacities and preliminary forecasts.
Notes: Market size refers to EVs and batteries, manufacturing capacity only to the battery cells.
Sources: IEA (2024), Energy Technology Perspectives; IEA (2025), Global EV Outlook.

Energy efficiency technologies play an increasing role in global manufacturing, an innovative space with opportunities for start-ups and established industry

Strong market and production capacity growth has begun shifting the overall landscape of industrial production towards clean energy and energy efficiency technologies. The share of global investment in manufacturing capacity has remained relatively constant for traditional sectors such as pharmaceuticals, basic chemicals, steel and glass, but clean and energy efficiency technologies increased their overall share by 67% from 2022 to 2023 alone. On the demand side, for example, batteries have seen an increase of almost 50% in their relative share of capacity investments. This reflects the fact that clean and energy efficient technologies were responsible for over 9% of overall global manufacturing capacity investment growth in 2023, and batteries alone accounted for almost 5%.

The largest part of manufacturing capacity growth in clean and energy efficient technologies is happening in China. While Europe was the largest market for clean and energy efficient technologies in 2010, China has since surpassed it and now holds more than 50% of the global market at about USD 400 billion, ahead of Europe and the United States.

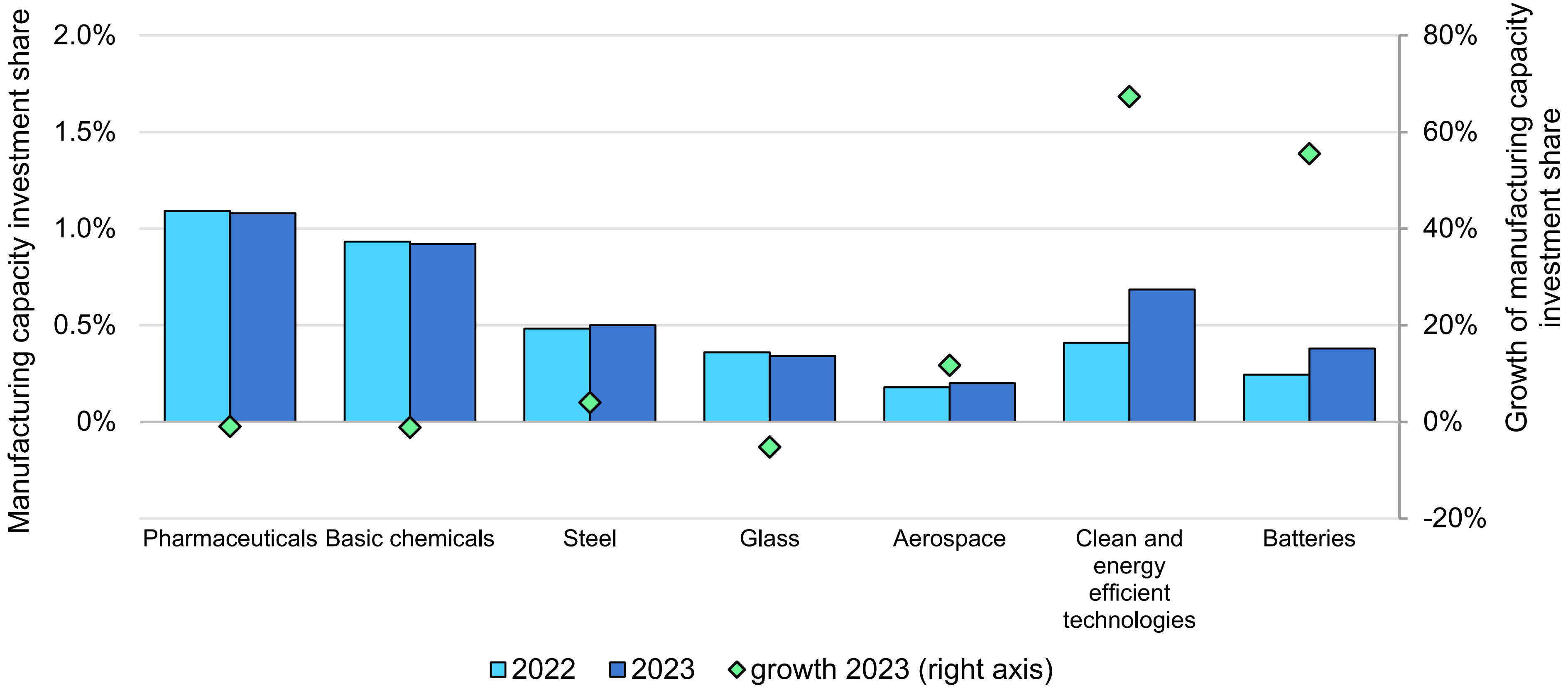
The sales development of EVs is a key example. In 2024, China sold over 11 million electric cars accounting for nearly 50% of all car sales in 2024. Despite some market headwinds, the EU maintained a strong position, with the sales share of EVs remaining around 20%. Globally, nearly 80% of EV battery cell production took place in China in 2024. Similarly, with rising natural gas prices at the onset of the energy crisis of 2022, leading heat pump manufacturers announced plans to invest more than USD 4 billion in Europe, while the three largest European producers of insulation material commited investments of about USD 1 billion over the last three years in Europe alone.

While major producers continue to strengthen their market positions, the number of registered energy efficiency startups has steadily increased since the early 2000s. Leading economies like China and the United States have reduced their share of registrations of energy efficiency startups since then, with the stongest increases recorded in European countries, such as France, the Netherlands and Sweden. Meanwhile, countries without a traditional automobile industry have founded EV manufacturers.

The trend is also clear in investor confidence data. The market capitalisation of the seven largest battery manufacturers increased from about USD 60 billion in 2019 to over USD 400 billion in 2023, while exclusive electric vehicle manufacturers grew their market capitalisation from about USD 60 billion to USD 740 billion.

Clean and energy efficient technologies are rapidly increasing their share of investment in global manufacturing capacity, overtaking the steel, glass and aerospace sectors

Clean and energy efficiency technologies manufacturing capacity investment shares, 2022-2023



Sources: IEA (2024), Advancing Clean Technology manufacturing; IEA (2024) Energy Technology Perspectives.

Investment in energy efficiency innovation is growing, with public RD&D spending on efficiency now exceeding any other energy technology

In order to compete in the growing market for energy efficiency, market actors are reacting not only by increasing capacity, but also by innovating. Public and private actors invested over USD 600 billion in energy efficiency in 2023. This increase of almost 150% since 2015 is a clear signal that energy efficiency products are in growing demand.

Governments have also taken steps to support industries in their efforts to achieve a competitive position in the market for energy efficiency products. In 2023, governments spent more on research, development and demonstration (RD&D) for energy efficiency than on any other energy technology, ahead of nuclear and renewables. In 2015, public RD&D spending on energy efficiency in IEA Member countries was about USD 4 billion, but by 2024 it had increased by almost 70% to USD 7 billion. The United States spent by far the largest share of any IEA country on public RD&D on energy efficiency technologies, around 44% of the IEA total in 2023, followed by Canada, France and Japan. Around two-thirds of the spending in the United States was on efficient transportation, followed by industry and buildings.

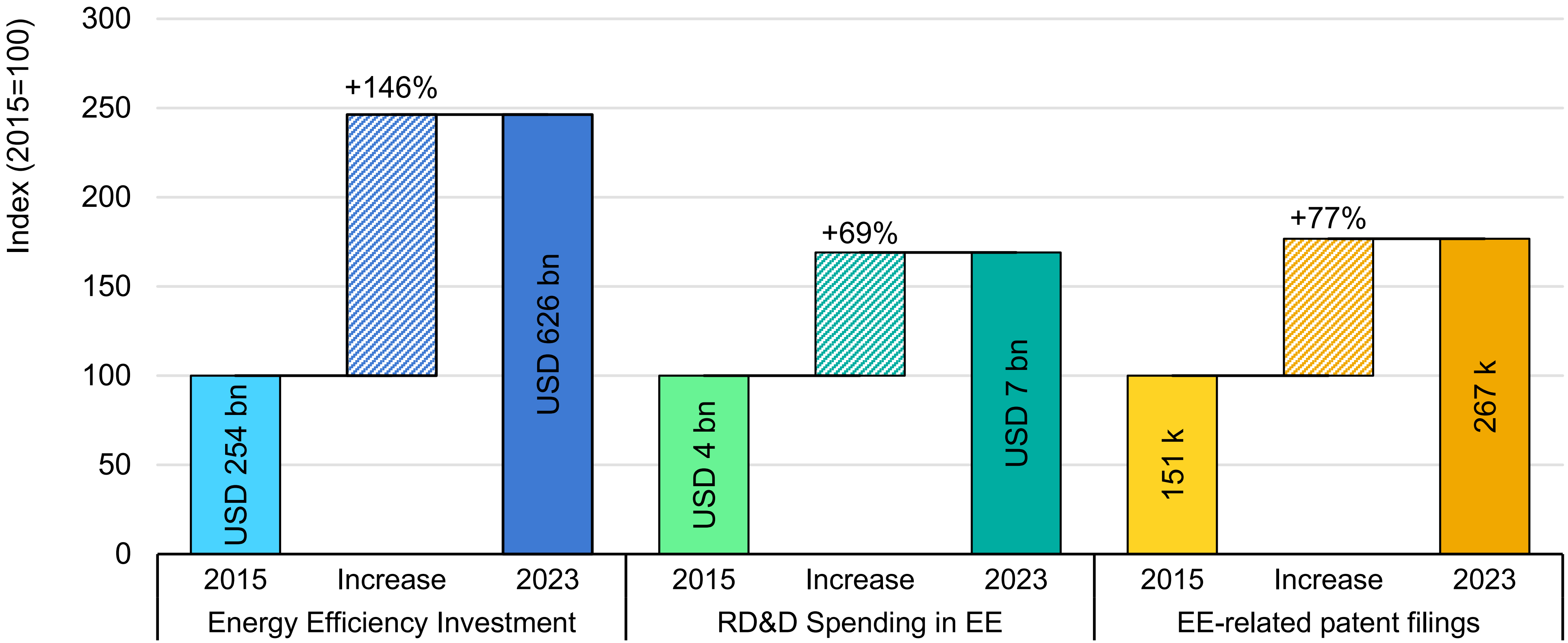
In an IEA survey of 1 000 industrial firms, 63% indicated that they had increased their RD&D spending for energy efficiency products in recent years, and another 18% reported having plans to do so in the next three years. Most indicated that the purpose of these RD&D investments was to launch new product lines. Among the many public examples around the world, Salzgitter AG, a large German steel manufacturer, is investing USD 2.6 billion in the SALCOS direct reduction electric arc furnace steel production route, and Daikin, a major Japanese air conditioner and heat pump producer, more than doubled RD&D spending, from USD 350 million in 2015 to USD 800 million in 2024.

While a significant part of public and private RD&D spending is not publicly disclosed, the result of these efforts becomes visible when analysing patent filings in that timeframe. Between 2015 and 2023, the number of patents filed for technologies related to energy efficiency increased from about 150 000 to almost 270 000, an increase of more than 75%. The dynamics also show the high ambition of Chinese manufacurers towards global leadership in the energy efficiency sphere. While in 2015, just under 50% of patents were filed in China, this figure climbed to about 70% in 2023.

These trends are also reflected in policy discussions and frameworks around the world, with regions seeking to strengthen the competitive position of their industries in this growing market. For instance, the European Union's Competitiveness Compass notes that many energy efficiency technologies are manufactured in Europe, which can support the region's economic competitiveness.

Investment in energy efficiency technology development is scaling up

Change of energy efficiency investment, R&D spending and patent filings related to energy efficiency, 2015-2023



Sources: IEA analysis based on data from IEA (2024), World Energy Investment; IEA (2024), Energy Technology RD&D Budgets; WIPO (2025), Patentscope.

Chapter 4.
Policy implications

An integrated policy package is key to deliver value to businesses and the economy

Government intervention can help enhance industrial energy efficiency through effective policy packages. To create effective drivers and preconditions for increasing energy efficiency in the industry sector, policy packages combine three main mechanisms, regulation, information and incentives:

- **Regulation** is essential to exclude the worst performing equipment and practices from the market, driving greater energy efficiency at both firm and national level.
- **Information** improves firms' awareness and knowledge of their energy efficiency options, highlighting benefits and enabling more efficient choices in energy-related purchases and use. Increased capacity building and training can create the skilled workforce required to deliver energy efficient soluions.
- **Incentives** make efficient options more attractive to firms and can be targeted to expedite upgrade and replacement technologies, encourage use of new technologies and practices, and accelerate uptake of energy saving measures.

Although the ultimate goal is a policy package framework that includes multiple instruments, in the short term, it can be useful to prioritise and target competitiveness. Some policy instruments can be quicker to implement or have greater impact, depending on national circumstances, such as the existing policy mix, the structure and size of the economy, the available fiscal space and the structure of the country's institutions. Additionally, the policy package approach must be accompanied by the right support for implementation. This means ensuring that resources are in place to put policies into action, regularly assessing policies and programmes and addressing vital elements, such as capacity building, enforcement and monitoring.

For the industry sector, a key challenge for policy makers can be to assess and clearly communicate the value of energy efficiency policies. This is primarily due to the lack of robust practices for collecting data on results achieved, including the wider benefits beyond energy savings or reduction of greenhouse gas emissions. An IEA survey of 1 000 industrial firms, conducted in 2025, indicates that more than half of the companies have experienced a broad range of benefits from energy efficiency and 88% can quantify or estimate the monetary value of these benefits.

While energy efficiency policies and programmes targeting industry have been shown to be cost-effective, collection and analysis of more granular data in co-operation with the industry sector can improve the design, adaptation and targeting of policy packages.

In terms of competitiveness, there is a strong case for increased focus on energy efficiency programmes and policies for less energy-intensive industry and for SMEs. For SMEs, this is due to both the high level of savings currently achievable (up to 30%) and to their contribution to job creation and global economic development.

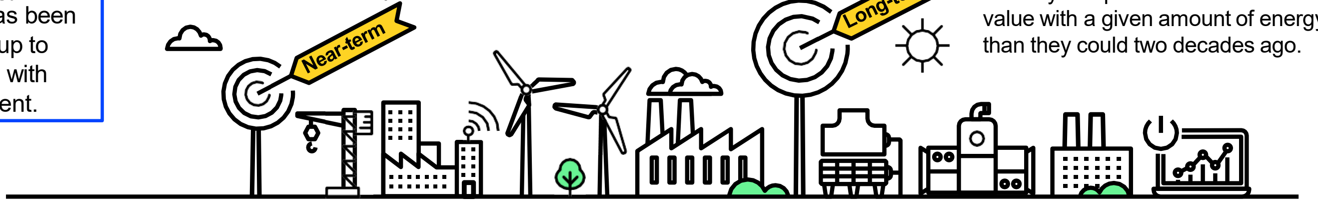
Policy Package – Industry Energy Efficiency

Immediate opportunities

Implementing better energy management practices has been shown to deliver savings up to 15% in the first 1-2 years, with little or no capital investment.

Heavy industry accounts for over two thirds of global industrial emissions, while over 70% of short-term industrial energy efficiency savings are in light industry and SMEs.

Efficiency improvements are critical to enhancing industrial productivity over the longer term. Even today, the world's industry can produce 20% more added value with a given amount of energy than they could two decades ago.



REGULATION

- **Minimum Energy Performance Standards** for key equipment, such as motors and pumps, can drive up overall industrial efficiency levels.
- **Regulation** extends beyond technology to target areas such as research and development, energy auditing, mandatory consumption reporting, energy management systems, and upskilling of the workforce. Incorporating life cycle impacts into regulation helps promote material efficient choices at the design stage.
- **Regulatory instruments** yield best results when they are rooted in a good understanding of local context and include ambitious, regularly updated, standards.
- **Regulations to ensure demand side response capabilities** help provide flexibility to the grid.

INFORMATION

- **Benchmarking, indicators and other forms of detailed data** allow governments to track the progress of policies and allow industries to compare their energy performance with that of their peers.
- **Digital technologies** enable industries to track energy use in real time and help ensure flexible demand side response, resulting in energy optimisation and cost saving opportunities.
- **Sharing information on energy efficiency best practice** through targeted information and industry networking activities helps industries raise ambition and improve energy performance.

INCENTIVES

- **Incentives** such as preferential finance, links to carbon trading, obligations and tax-based measures can motivate crucial energy efficient decisions at the process design and equipment selection stage, supporting industry's transition to near zero emission technologies.
- **Free or subsidised energy audits**, often targeted at SMEs and other sectors of strategic importance, can help rapidly increase energy efficiency.
- **Policies to foster Energy Service Companies** provide industry with access to significant external energy expertise and attractive structured financial packages.
- **Incentives for the reuse and recycling** of materials reduce the need for higher-emission primary materials production.

Five key energy efficiency policy mechanisms for industrial competitiveness

There are many ways in which governments can support industry to reduce energy use and increase competitiveness. An analysis of top performing IEA countries on how they achieve and maintain low levels of industrial energy intensity while continuing to grow identifies five key common shared industrial policy mechanisms:

1. Comprehensive energy management policies

Policies that stimulate the adoption of various actions related to energy management (such as audits, energy management systems and appointment of an energy manager) are generally associated with improved and sustained energy efficiency regardless of industry location, sector or size.

2. Support and interaction with industrial networks

Initiating, supporting and engaging with industrial networks has resulted in an increase in energy efficiency at firm level and an increase in the uptake of industrial policies at government level. Networks have been identified as crucial in building trust between governments and industry, and in developing and delivering industrial energy efficiency policies.

3. Targeted fiscal supports and financing mechanisms

Targeting fiscal supports is a key lever to overcome barriers to the uptake of energy efficiency in the industrial sector. Supports can be related to an action (audit or capital project) or to specific performance (a targeted level of saving). Supports can also be leveraged to address particular sectors or groups that are of strategic or economic significance. Financing mechanisms can be designed to work with the industrial sector, encouraging greater investment in energy efficiency.

4. Investment in research and innovation

Policies that stimulate development and commercialisation of new energy efficiency technologies and techniques are instrumental in advancing progress on industrial energy efficiency. Over the long term, pursuing policies that favour the development of technologies can create new and competitive capabilities, helping position countries that have invested in RD&D as technology producers and even innovation leaders.

5. Strong support of Minimum Energy Performance Standards (MEPS) for motors and other industrial equipment

Policies to improve the minimum energy performance standards of motors and motor systems have been proven to lead to an overall improvement in the energy performance of the motor stock, leading as well to improved performance, reduced energy load and reduced energy consumption. MEPS can also be used for other industrial technologies, such as compressors, refrigeration systems and air conditioners.

Case studies

Case studies from around the world illustrate the impact of policies

The following case studies are sucessful examples of the policy package approach, incorporating a range of measures to address specific barriers and foster implementation of energy efficiency. The assessments presented are generally in terms of energy savings and/or emissions reductions. However, in all cases these policies support economic development and reduced risks for strategic industrial sectors.

India: Mandatory energy reduction targets coupled with incentivising trading mechanism

The Perform Achieve and Trade (PAT) scheme in India combines regulation, through mandated specific energy reduction targets, with a market-based savings trading mechanism that contributes to cost-effectiveness and can give companies incentives to exceed targets. In addition, the government provides information to support implementation, such as sectoral guidelines and training and certification of auditors. In the 2022-23 financial year, energy efficiency policies and programmes in India delivered energy savings in the order of 50.75 Mtoe, equivalent to 6.6% of the total primary energy supply of the country. More than 50% of that was achieved through the PAT sheme. During 2022-23, policies targeting large and small industries in India delivered monetary savings of INR 586 billion (about USD 7 billion).

The Indian cement industry, to focus on one sector, surpassed its energy efficiency targets by 81.6% in PAT Cycle I and 48.6% in PAT Cycle II. The energy savings realised by the cement industry are estimated to have resulted in monetary savings equivalent to more than INR 95 billion (about USD 1 billion) (PAT I) and INR 300 billion (about USD 3.5 billion) (PAT II). In terms of overall specific energy consumption, the average cement power consumption fell from 88 kWh/MT (kilowatt-hour/million tonnes) of cement in 2014 to 73.75 kWh/MT of cement in 2023, and average clinkerisation power was reduced from 65 kWh/MT of clinker to 51.5 kWh/ MT of clinker. Through energy efficiency measures, the Indian cement industry has not only achieved operational cost reductions, but also expanded production capacity by 61% between 2012 and 2023 and strengthened its market position.

Brazil: Supporting SMEs, leveraging private investment and creating markets

The Transformative Investments for Industrial Energy Efficiency (PotencializEE) programme in Brazil has been actively supporting SMEs in the industrial sector in the Brazilian state of São Paulo since 2020. It offers subsidised energy audits paired with low-collateral and low-interest loans to facilitate implementation of energy efficiency projects. The programme provides a package of measures to support energy efficiency implementation, including awareness raising and training, support to energy service companies, an energy technology list, a pre-financing mechanism and capacity building for banks on energy efficiency

By December 2024, the programme in Sao Paulo State had supported over 1 400 SMEs, trained nearly 500 energy efficiency experts and conducted over 400 detailed energy audits. The 164 projects approved for implementation or financed are expected to lead to cumulative energy savings of 4 400 GWh and a reduction of 230 000 tonnes of CO_2 emissions. The initiative has demonstrated higher energy-saving potential in smaller companies with older equipment, achieving average savings of 20% to 30%. Building on its early success, the programme has been extended to 2027, and the Brazilian government has committed to expanding the programme to five additional states, supporting an additional 1 000 SMEs directly and 10 000 micro, small and medium-sized enterprises indirectly.

Ireland: Energy management, peer-to-peer exchange and reporting requirements

Ireland's Large Industry Energy Network (LIEN) is an information and incentive programme that supports large energy users to improve their energy efficiency and reduce their carbon emissions. The network is built around the use of energy management (ISO 50001), sharing of best practices (workshops, site visits and special working groups) and annual reporting and performance tracking. It has 210 voluntary members, who account for approximately 17% of Ireland's national energy consumption. Analysis of 133 member companies that reported in both 2018 and 2023 shows a 12% reduction in Scope 1 emissions (3 362 kt CO_2 to 2 947 kt CO_2). Data suggests that progress towards Ireland's 35% Scope 1 reduction target for industry by 2030, within the LIEN, is almost on track.

Mexico: Improving efficiency across supply chains through strategic partnerships, awareness raising and capacity building

The essence of Mexico's Programa Liderazgo Ambiental para la Competitividad (PLAC, Environmental Leadership for Competitiveness) was to contribute to improving the competitiveness of businesses through pollution prevention projects, including energy efficiency. The programme operated from 2012 to 2019 and worked with more than 7 000 SMEs. It aimed to increase the environmental performance of SMEs' customer-supplier co-operation networks. Building on partnerships with education and research institutions, the programme delivered capacity-building and technical support and provided peer-to-peer learning opportunities. On average, for each dollar invested by the government, the enterprises invested USD 3 and obtained savings of USD 4.60, with a payback period of nine months. In total, savings of over USD 340 million and 1 478 GWh of energy were achieved, reducing participating companies' bills by USD 340 million. A positive outcome of the programme has been that it has strengthened the relationship and engagement between large companies and their supply chains, thereby contributing to supply-chain resilience.

Additional energy efficiency policies targeting industry in selected countries

Programme	Policy type	Average incremental energy savings per year as a % of national industrial energy use (estimated)	Policy description
Italian Audit Scheme, Italy	Regulation	0.63%	Energy audit requirement for large firms and energy consuming companies, including SMEs, every four years, with requirement to implement measures.
White Certificates, Italy	Regulation	0.65%	Obligation for large electricity and gas distributors to meet annual primary energy savings targets through end-user energy savings. Energy savings are certified and traded on a marketplace.
Energy Efficiency Networks Initiative, Germany	Information	0.34%	Industry networks aimed at boosting energy efficiency in industry, the crafts, trade and commerce.
Industrial Assessment Centres, United States	Information	0.22%	Free energy audits for SMEs, enabled through competitive five-year grants.
ProkiloWatt, Switzerland	Incentive	1.23%	Subsidy of up to 30% of investment costs into electricity-saving measures.
National environmental support (UFI), Austria	Incentive	0.47%	Subsidies supporting energy efficiency renewable energy and research.
'Wallonia Industry Agreements' Belgium	Incentive	1.05%	Long term agreement granting tax relief to firms that commit to energy efficiency measures and emissions targets.

Programme	Policy type	Average incremental energy savings per year as a % of national industrial energy use (estimated)	Policy description
Danish Voluntary Agreements, Denmark	Incentive and Information	0.89%	Multi-year agreement granting electricity tax relief to firms that successfully complete a package of energy efficiency actions and implement measures with a payback of less than five years.
Mandatory energy audits, Korea	Regulation and information	1.25%	Requirement for large energy consumers to undertake energy audits every five years.

Note: Energy savings included in calculations do not account for additionality.
Sources: Baringa Partners LLP for the Department of Energy Security & Net Zero (2023), International Industrial Energy Efficiency Policy Case Studies.

IEA Publications
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