TODAY'S CONTEXT

The Industrial Energy Efficiency Playbook

Improving energy efficiency: three pillars, 10 actions

Updated edition – May 2026

Contents

Why an updated edition?

The first edition of the Energy Efficiency Movement's Industrial Energy Efficiency Playbook, published in 2022, noted that the world's industries stood at an energy crossroads. The invasion of Ukraine had put energy cost and security on the agenda, and climate goals were slipping.

If this sounds familiar, it is because these energy cost, security and sustainability challenges remain — but the stakes have grown. Energy-related geopolitical risks are higher than ever.

And yet, despite evolving risks, the path away from these threats remains unchanged from 2022. Industry urgently needs to reduce its dependence on costly and risky fossil fuel supplies, by electrifying processes and tapping into renewable energies.

But the fastest, most immediate lever remains improved energy efficiency. Every watt or joule of energy not wasted is a dollar saved and an externality avoided.

Energy efficiency not only reduces operating costs and shields industries against energy price volatility but also improves the lifetime of assets and can even, if applied at a system level, drive new revenues.

The opportunity for improving industrial energy efficiency is enormous. Today, almost two thirds of all primary energy is wasted instead of doing useful work.[1] In industry, up to half of all energy is lost as heat and as much as 30% of this waste could be used elsewhere.[2]

Despite this potential and the fact that industry accounts for about 40% of global energy demand,[3] plus a growing awareness among decision makers of the importance and value of more energy- efficient processes, industrial leaders have been slow to improve the efficiency of their operations.

The International Energy Agency said in 2025 that "industrial energy efficiency progress has barely moved at the global level, improving by just 0.2% per year between 2019-23."[4]

There are signs that this could be about to change, however.

In 2025, the IEA and the Energy Efficiency Movement brought together CEOs to work on a four-point action plan committing industry to drive energy efficiency progress, advancing affordability, strengthening security and boosting industrial competitiveness.[5]

Moreover, just as the case for implementing industrial energy efficiency has grown, so too has the range of tools, technologies and support mechanisms available to accomplish implementation.

For these reasons, now is the right time to revisit the Industrial Energy Efficiency Playbook and update it for today's reality.

The (stronger) case for energy efficiency

Energy efficiency, in general terms, is a key metric in any industrial process. Put simply, if you can produce more with lower inputs then you can improve competitiveness and increase market share.

This rule has helped global industries achieve commendable levels of energy efficiency improvement over prolonged periods. There was an average 1.8% average annual progress on energy intensity between 2010 and 2019, for example.[6]

However, the rule comes with a couple of caveats. One is that energy costs are rarely the only or even major consideration in process design. If energy is relatively cheap and abundant then using it efficiently may not be an issue compared to, say, securing raw materials or scaling production.

The other caveat is that once a process has been fixed at industrial scale then it can be hard to change things. Such factors may help explain why industry energy intensity improvements have stalled this decade, averaging just 0.2% a year.[7]

But at the same time, the arguments for improving energy efficiency have grown stronger. For example, fossil fuel price volatility is growing. Average monthly Brent prices have varied more than 340% in the 10 years,[8] affecting not only oil pricing but the whole energy system.

And just two countries control 30% of oil and 40% of gas production, exacerbating supply chain risk.[9] At the same time, energy is increasingly at a premium.

Global primary energy use grew 145% in the 50 years to 2024[10] and electricity demand could grow by 1.1 petawatt-hours a year through to 2030.[11] Yet three quarters of the energy we use now comes from fossil fuels[12] that will start running out in the next 50 years.[13]

Additionally, there is growing awareness of the potential for energy efficiency to improve economic performance, build resilience, meet climate-related regulatory requirements and create employment. “Energy efficiency delivers more than energy savings and emission reductions,” says the IEA.[14]

“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.”

Around 80% of industry leaders now see energy efficiency as key to their companies’ competitiveness, the IEA says.

“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 $600 billion,” it adds.[15]

Improving energy efficiency: three pillars, 10 actions

As the case for industrial energy efficiency has improved, so has the range of support mechanisms available for the implementation of projects and programs.

A growing policy focus on energy security, affordability and sustainability has unleashed public finance and private capital, with global spending on energy efficiency and end use rising 72% from $450 billion in 2015 to $773 billion in 2025, according to the IEA.[16]

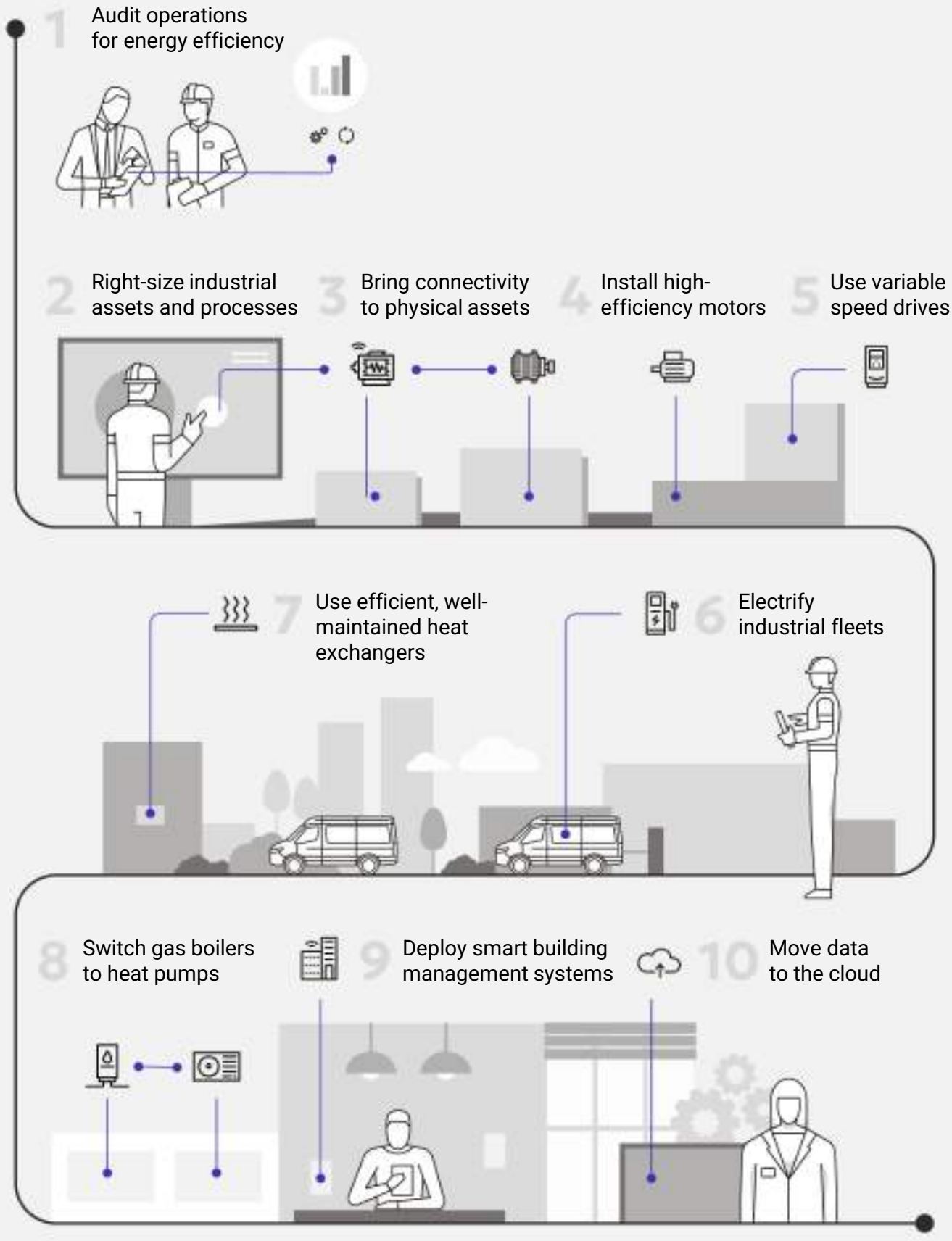
At the same time, bodies such as the Energy Efficiency Movement have emerged to help guide industry towards more energy-efficient operations.

In The Case for Industrial Energy Efficiency, the Movement details 10 actions that industrial leaders can undertake now to save $437 billion a year by 2030.[17]

$437B

of economies can be achieved by industrial leaders due to the 10 energy efficiency actions.

10 actions companies can take right now to reduce energy costs and carbon emission



These actions are grouped into three pillars:

- Building a foundation by auditing energy use, making sure equipment and processes are correctly dimensioned and connecting physical assets for monitoring and control.
- Driving efficiency returns by investing in technologies such as high-efficiency motors, variable speed drives, efficient heat exchangers and electric vehicles.
- Gaining efficiency insights and reaping the benefits of digitization by embracing cloud computing and smart building management systems.

A three-pillar strategy for industrial energy efficiency

Gain efficiency insights

- Move data to the cloud
- Deploy smart building management systems

Drive efficiency returns

- Switch to heat pumps
- Maintain efficient heat exchangers
- Electrify industrial vehicle fleets
- Use variable speed drives
- Install high-efficiency motors

Build an efficiency foundation

- Bring connectivity to physical assets
- Right-size industrial assets and processes
- Audit operations for energy efficiency

Although industrial players could potentially benefit from any energy efficiency action at any point in time, the Energy Efficiency Movement pillars provide a strategic framework for implementation, moving from easily achievable actions to ones of greater complexity and ambition, as follows.[18]

10 actions in detail

PILLAR 1 Build an efficiency foundation

1 Understanding Your Starting Point with an Energy Efficiency Audit

Potential Savings: Up to 20% reduction in emissions.

How Energy Can Be Saved: Conducting energy audits to identify major opportunities for cost and emissions reduction. Audits can range from basic assessments to in-depth interventions, helping to pinpoint energy wastage.

Why: Many industrial companies are unaware of their energy wastage due to poorly maintained or oversized machines. An energy audit helps uncover these inefficiencies, providing a clear starting point for improvements.

2 Rightsizing Industrial Assets and Processes

Potential Savings: Significant reduction in energy costs and emissions.

How Energy Can Be Saved: Adjusting machine settings or reconfiguring production systems to eliminate oversized, energy-guzzling assets. This helps in reducing unnecessary energy consumption.

Why: Oversized machines often consume more energy than needed, adding to electricity bills and carbon footprint without providing additional benefits. Rightsizing ensures that energy is used efficiently.

3 Bringing Connectivity to Physical Assets

Potential Savings: Up to 30% reduction in energy use; potential industry savings of up to $259 billion a year by 2030.

How Energy Can Be Saved: Utilizing the Internet of Things (IoT) to connect industrial assets, which enhances energy efficiency by reducing downtime and maintenance costs.

Why: IoT enables real-time monitoring and optimization of industrial processes, leading to significant energy savings and operational efficiencies.

PILLAR 2 Driving energy efficiency returns

4 Using High-Efficiency Motors

Potential Savings: Up to 10% reduction in worldwide electricity consumption; potential savings of $71.6 billion a year by 2030.

How Energy Can Be Saved: Upgrading to high-efficiency motors, such as IE5 motors, which offer lower energy losses compared to standard motors.

Why: High-efficiency motors consume less electricity and have a quick payback period, making them a cost-effective solution for reducing energy consumption.

5 Using Variable Speed Drives

Potential Savings: The system efficiency of pumping systems can be improved from 28% to 82%.

How Energy Can Be Saved: Implementing variable speed drives to match electricity consumption with the actual work being done by devices, improving overall system efficiency.

Why: Variable speed drives optimize the performance of motors, reducing energy waste and improving efficiency in various industrial applications.

6 Electrifying Industrial Vehicle Fleets

Potential Savings: Emissions reduction of 17% to 70% depending on the electricity source.

How Energy Can Be Saved: Transitioning to electric light-duty vehicles for industrial fleets, which are more efficient and produce fewer emissions compared to internal combustion engine models.

Why: Electrifying vehicle fleets reduces reliance on fossil fuels, lowers emissions and can lead to significant cost savings over time.

7 Maintaining Efficient Heat Exchangers

Potential Savings: Up to 25% efficiency gain; potential savings of around $55 billion a year.

How Energy Can Be Saved: Proper maintenance and upgrading of heat exchangers to more efficient plate technology, and reusing waste heat for other processes.

Why: Heat exchangers are often poorly maintained, leading to energy inefficiencies. Upgrading and maintaining them properly can significantly improve energy efficiency and reduce emissions.

8 Switching to Heat Pumps

Potential Savings: Emissions reductions of up to 52% for certain processes.

How Energy Can Be Saved: Using heat pumps for low and mid-temperature industrial processes, which are highly efficient and can significantly reduce fossil fuel consumption.

Why: Heat pumps are extremely efficient, providing more energy than they consume, making them ideal for reducing energy use in industrial processes.

PILLAR 3 Gaining energy efficiency insights

9 Deploying Smart Building Management Systems (BMS)

Potential Savings: Up to 1.5 petawatt-hours of electricity and 252 terawatt-hours of gas annually by 2030.

How Energy Can Be Saved: Implementing BMS to control building energy loads, particularly HVAC systems, which can reduce energy waste and improve overall efficiency.

Why: BMS can optimize energy use in buildings, reducing waste and improving comfort, security, and flexibility.

10 Moving Data to the Cloud

Potential Savings: Improved energy efficiency in IT operations.

How Energy Can Be Saved: Transitioning IT workloads to cloud computing, which benefits from optimized data center environments and low-carbon power supplies, reducing overall energy consumption.

Why: Cloud computing providers have strong incentives to improve energy efficiency, making it a more sustainable option for IT operations.

Industrial energy efficiency in action

Support for energy efficiency extends to a growing number of real-life case studies that demonstrate the value of projects in industrial settings. Here are three examples collated by the Energy Efficiency Movement.

Data center operator recovers enough waste heat to warm 7,000 homes

Social media giant Meta designed its data center in Odense, Denmark, to be one of the most energy efficient in the world. The facility came with hyper-efficient hardware cooled using outdoor air through indirect evaporative cooling technology, powered with renewable energy.

But one of the most innovative features of the data center was a sector coupling arrangement whereby **waste heat from the building is passed on to local heating company Fjernvarme fyn.**

This allows around 100 gigawatt hours of waste heat energy to be recovered a year, enough to warm roughly 7,000 homes through a district heating network.[19]

Annual savings of $120,800 at a paper manufacturer in Santa Catarina, Brazil

Brazilian paper manufacturer IPEL saved more than $120,000 a year through a 42% reduction in electricity consumption after **replacing fixed motor starters with variable frequency drives** that adjust their speed in line with process requirements.

Before the upgrade, the motors in IPEL's pulp preparation unit had operated 24 hours a day, regardless of workloads, leading to excessive energy consumption and premature wear.

IPEL's efficiency upgrade also included the **automation of the company's pulp pumping system**, which had previously been regulated by manually closing valves. The project had an expected payback time of 18 months.[20]

A 40% saving on natural gas consumption at an Italian automotive sector supplier

Italian manufacturer Brugola OEB Industriale, which makes Allen screws for the automotive industry, has achieved a range of benefits through a focus on industrial energy efficiency.

An **upgrade to compressed air generation systems**, for example, has helped cut electricity consumption by up to 35% at some of the company's plants. But arguably even more impressive is what the company has done with the residual heat coming off the compressors.

Instead of letting it loose into the environment, **this heat is now used to keep the company's plants and offices warm**, cutting natural gas use by 40%.[21]

100 gigawatt-hours and 4 million euros of savings a year at a European dairy producer

A German energy services company (ESCO) has helped a European dairy producer save around 100 gigawatt-hours of energy and 4 million euros a year after identifying more than 300 potential efficiency measures across processing sites in Belgium, Germany and the Netherlands.

The savings were achieved with the implementation of just 27 of the possible projects, with most of the remainder due to be implemented over a five-year period. The projects have also helped the dairy producer cut its emissions by 20,000 tonnes of carbon dioxide a year.

And all this has been achieved without any upfront cost from the dairy company. Instead, the projects have been funded through the introduction of an energy-as-a-service model and bespoke financing from energy efficiency finance specialist Solas Capital.[22]

Key energy efficiency questions for industrial decision makers

Where should we start with industrial energy efficiency?

Any efficiency gain is good, but it often makes sense to start with an audit. This will give you a clear picture of where energy is going before you commit capital or change operations.

An ESCO or similar can analyze your consumption patterns, catalog your equipment and identify where savings are possible. An energy efficiency audit will not deliver reductions directly but can typically be used to identify savings of up to 20%, depending on the level of detail involved.[23]

What delivers the fastest return on investment?

Motors and drives are often the best places to invest. If you run an industrial enterprise then around two thirds of your electricity consumption — and your electricity-related carbon emissions–likely relates to powering motors in pumps, fans, compressors and other equipment.

Installing variable speed drives can improve the energy efficiency of a motor-driven system by up to 30%, yielding immediate cost benefits. The payback time of a variable speed drive — one to two years — is short in relation to its expected lifetime. High energy prices obviously shorten it further.[24]

How significant is the opportunity in our buildings and facilities?

Heating, ventilation and air conditioning systems account for close to half of commercial building energy consumption, and around a third of that is typically wasted.

Smart building management systems, which use sensors and increasingly AI to adjust heating, cooling and lighting to actual occupancy, can cut HVAC-related emissions by up to 40% and reduce energy costs by around 25%.[25]

We run industrial vehicles and fleets. Is electrification worth it now?

The case for vehicle electrification has been thrown into stark relief as geopolitical tensions have increased fuel prices. Electric motors achieve over 95% efficiency compared to around 45% for diesel engines at optimal load.

Also, operating costs for electric vehicles run as much as 60% lower than diesel equivalents, mainly through lower fuel and maintenance costs. The upfront capital cost remains higher but falling battery prices are shifting the calculus.[26]

What role does data and connectivity play?

You can't manage what you can't measure. Yet most industrial organizations are still making efficiency decisions without real-time visibility into their operations.

Connecting assets reveals "ghost" energy consumers — pieces of equipment drawing power without doing useful work — and creates the data foundation for smarter decisions across every other efficiency initiative.

Is energy efficiency compatible with our decarbonization commitments, or is it just a cost story?

Both, and that's the point. The IEA describes energy efficiency as the "first fuel" of decarbonization — the fastest, most cost-effective lever available to industry right now.

Most energy efficiency measures use mature technologies, can be deployed quickly and deliver measurable results from day one. The business case and the climate case are the same.

Next steps

At a time of growing geopolitical and fuel price instability, energy efficiency should be on every industrial leader's agenda. Companies that fail to introduce energy efficiency measures risk seeing their competitiveness hampered.

Conversely, the means to reduce make money, build resilience, drive decarbonization and create jobs through industrial energy efficiency are greater than ever before.

The first and easiest step is for industry to share knowledge and best practice, creating networks where collaboration can be fostered and expertise can be extended. To that end, we encourage you to join the Energy Efficiency Movement now at **www.energyefficiencymovement.com**.

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