



Expertise – Passion – Automation

A full-page background image of a male industrial worker in profile, facing left. He is wearing a white hard hat, clear safety glasses, and large black earplugs. He is holding a laptop with both hands, and his right hand is on the keyboard. The laptop screen displays a complex industrial control system (ICS) interface with various colored buttons, lines, and text. The background is a large industrial facility with massive, shiny, metallic pipes and structural beams, suggesting a power plant or manufacturing environment.

**Embrace energy  
efficiency for a  
competitive edge**

The real impact of energy  
efficiency legislation and  
technology on global  
manufacturing





The impact of reliance on fossil fuels and poor energy efficiency on the environment has reached alarming levels. So much so that over 190 countries unanimously agreed to take measures to cut carbon emissions at the United Nations COP21 summit in Paris, 2015.

To do its part, industry has adopted various initiatives and embraced legislation, encouraging it to become more energy efficient. While this may seem like a burden to already stretched European manufacturers, it is an ideal opportunity to become more competitive and grow.

Businesses that embrace energy efficient techniques and tools improve manufacturing processes, save money on energy bills, impress clients searching for suppliers or partners that can demonstrate commitment to an environmental policy and increase the capacity in their business, allowing them to produce more.

This whitepaper will explore why pressure is growing on all industrial businesses to meet European targets and adhere to legislation. We will also explain where business can find help and how manufacturers can take advantage of new technology and initiatives to become more competitive.

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# Protect the environment, protect manufacturing

## Coming down to Earth with a bump

NASA's earth-orbiting satellites and other technological advances have allowed scientists to collect various types of data about Earth's climate and its impact on the environment. As NASA Science explains, the heat-trapping properties of carbon dioxide and other gases affects the transfer of infrared energy through the atmosphere. There is no question that increased levels of greenhouse gases will increase global warming.

While global warming has been increasing over the last 35 years, the warmest years on record were 2010 to 2016. Not only was 2016 the warmest year, but eight of the twelve months were the warmest in history for those months, according to NASA Science.

Ice cores drawn from Greenland, Antarctica and tropical mountain glaciers clearly demonstrate that the Earth's climate responds to changes in greenhouse gas levels. This response – along

with human activity – has a direct effect on the world's flora and fauna. The World Wide Fund for Nature (WWF), formerly known as the World Wildlife Fund, dedicates much of its resources to battling the results of climate change, which has been driven by burning fossil fuels, breeding large herds of methane-producing livestock and deforestation.

According to the WWF, even subtle changes in the climate can have drastic effects on forests, oceans and entire species, leading to the extinction of a wide number of plants and animals. For example, the WWF refers to our oceans as vital 'carbon sinks', because they absorb large amounts of carbon dioxide, preventing it from reaching the upper atmosphere. However, increasing water temperatures and carbon dioxide concentrations are making oceans more acidic and, therefore, dangerous for everything living in them.

*“No matter what we’re passionate about, something we care about will be affected by climate change.”*

World Wide Fund for Nature (WWF).

This brought world leaders from over 190 countries together at the end of 2015 to draw a line in the sand and agree how to take control of the problem at the Paris Climate Conference, or COP21, in November 2015.

The initiative made history with the unanimous agreement to collaboratively keep global warming below two degrees Celsius.

The agreement formally came into force on November 4, 2016, shortly before COP22. It has now been ratified by 169 countries, including the European Union 28, representing 87.375 per cent of global greenhouse gas emissions. The ultimate goal of the landmark agreement is to limit the amount of greenhouse gases resulting from human activity to the same levels that trees, soil and oceans can naturally absorb by some point between 2050 and 2100.



Manufacturing energy efficiency

While driving cars, farming livestock and powering consumer electrical goods are all massive contributors of carbon dioxide emissions, industry contributes more than its fair share to the problem. Reliant on energy greedy processes, contingent on the burning of fossil fuels, global manufacturing is in the spotlight.

Following the ratification of the COP21 agreement, the European Commission proposed a set of new EU energy laws for 2020-30. This collection of laws was bundled together in the Clean Energy for All Europeans package, which is intended to implement the Paris agreement and advance EU energy policy in favour of decarbonisation. This package was presented and approved in the last UN conference COP24, which took place in Katowice, 2018.

Based on analysis by Agora and Sandbag, The European Power Sector in 2017 report stated

that energy consumption rose in every country except the UK in 2017. The report outlined several reasons for this, chief among which was the fact that progress in energy efficiency is insufficient to keep up with Europe's economic recovery.

Evidence in the report demonstrates that while current efforts are making an impact, it is not enough to meet the EU's overall target of cutting greenhouse gas emissions by at least 40 per cent by 2030.

In addition, the report explains that industrial production also rose faster than European gross domestic product (GDP). This means that economic growth witnessed in 2017 was because of more energy-intensive processes than usual.

There was a four per cent increase in industrial production in the 2016-17 period, according to the EUROSTAT index, something that is accredited

in part to production in South Eastern European countries regaining pre-financial crisis levels. On top of this, the World Steel Association released figures showing that steel manufacturing rose by five per cent between January and November of 2017 in Germany, Italy and the Czech Republic.

Looking at these figures, it's plain to see why it is important for businesses to invest in energy efficient technology and systems. But there is also good news. The European Power Sector in 2017 report also found that renewable energy generation rose sharply in 2017. The increase came from the growth of wind, solar and biomass generation, which rose by 12 per cent in 2017 to 679 Terawatt hours - putting renewable energy above coal generated power for the first time.

The efficiency effect

Remaining compliant with changes in legislation and saving the environment are great reasons for global manufacturing to adapt processes, but the bottom line is always there. However, the International Energy Agency's (IEA) Energy Efficiency 2017 report demonstrates that investing in energy efficiency can drastically reduce energy usage and spending.

This research shows that the use of energy management systems in industry has increased, which has resulted in energy use per unit of economic output in the industrial sector falling by nearly 20 per cent between 2000 and 2016. The IEA attributes some of this success to an increase in policy and financial incentives.

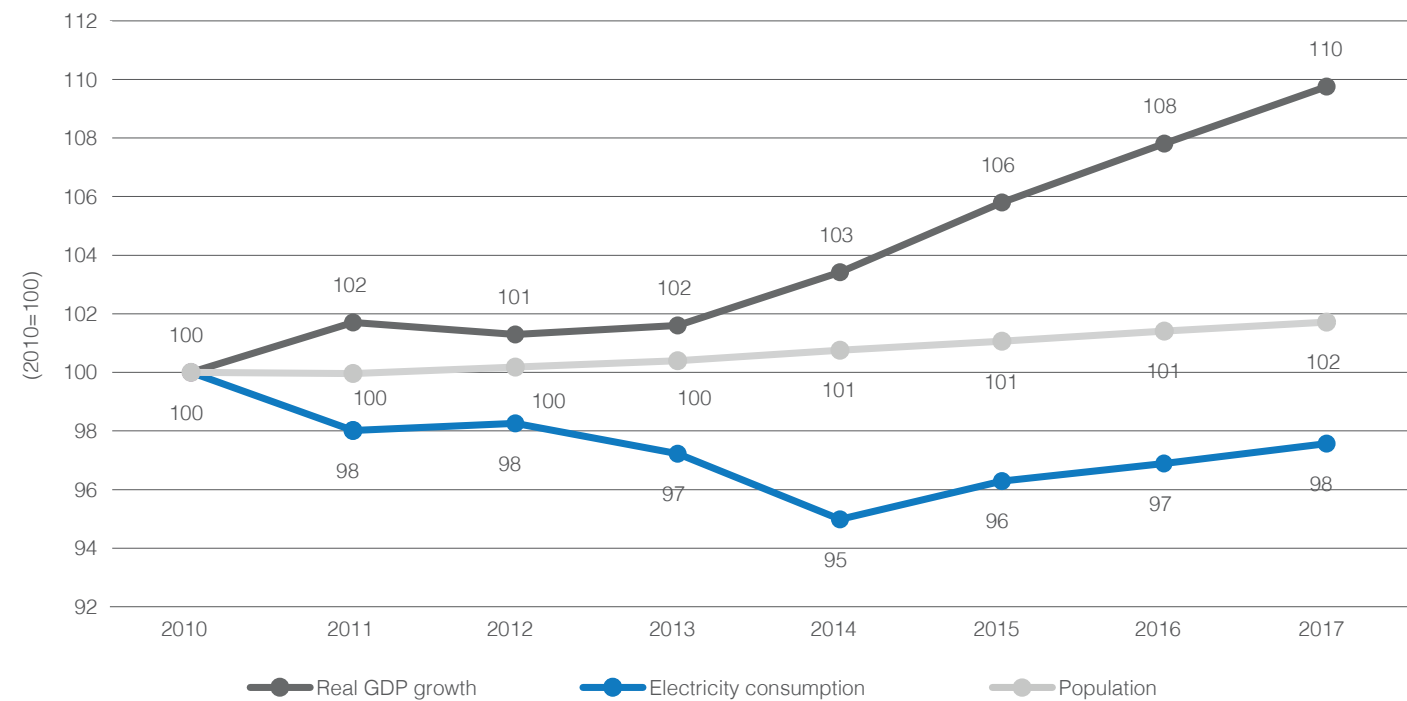
For example, the number of certifications for ISO 50001, the global standard for energy consumption developed by the International Organisation for Standardization (ISO), increased to nearly 12,000 in 2015 – 85 per cent of which were in Europe.

Another interesting finding shows that, for the first time, energy efficiency has become a tradeable commodity in several countries. In France and Italy, changes in policy increased the market value of energy savings in 2016. These savings were traded in the form of white certificates, making money for the companies involved. In the United States, similar record levels of demand savings, resulting from energy efficiency, were also accepted in the two biggest electrical capacity auctions in the nation.

Eight of the top ten countries to show the largest improvement in energy efficiency since 2000 are all European states, as demonstrated in the below graph. All of these countries, with the exception of Switzerland, are covered by the European Union's Energy Efficiency Directive (EED).

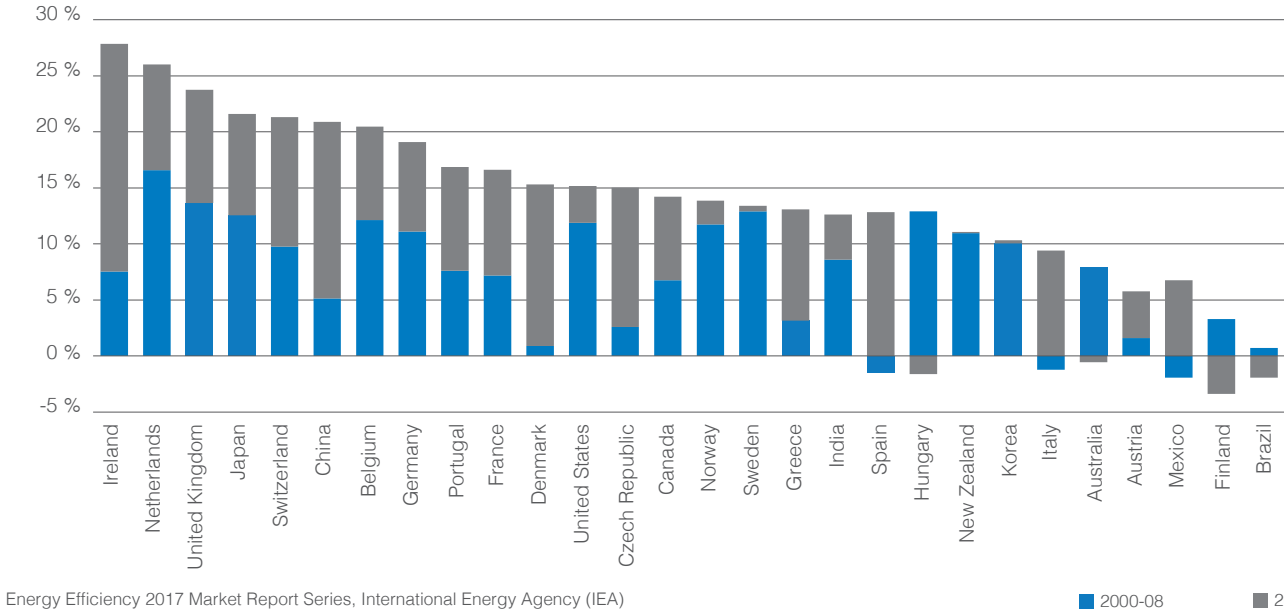
“The advanced uptake of ISO standards demonstrates the importance European industry is placing on aligning ideals and practices across the EU market,” said Davide Lanotte, area manager thermoproducts and energy saving projects SMC Italia

EU electricity consumption (indexed)



EUROSTAT 2018 - European Power Sector in 2017, Agora Energiewende

Percentage improvement in the efficiency effect for select countries, 2000 - 16



Energy Efficiency 2017 Market Report Series, International Energy Agency (IEA)

2000-08 2008-16

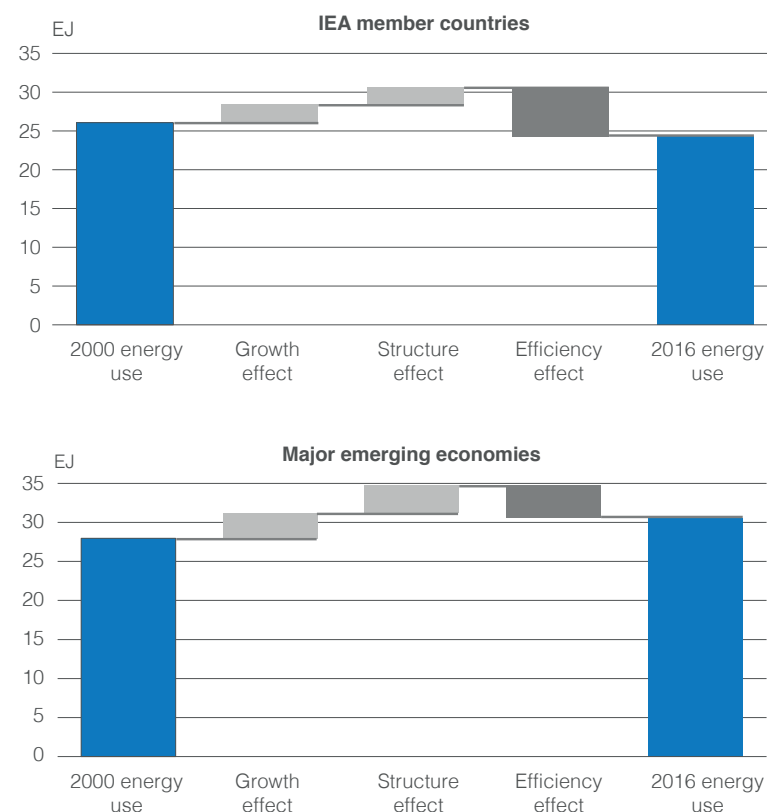


The graph also shows the improvements before and after 2008, marking the impact of policy developments, particularly in China, where the influence of the eleventh and twelfth Five-Year Plans is demonstrated by a 16 per cent improvement in energy efficiency since 2008.

The IEA also summarises the impact of what it calls the efficiency effect. The 2017 report concludes that, “...without the combined impacts of energy efficiency and structural change, final energy use in the industry and services sector would have been much higher.”

The efficiency effect is the proof that industry’s adoption of efficiency systems is having a positive impact. For example, in IEA member countries, underlying demand for energy services increased between 2000 and 2016. However, this was more than offset by a 20 per cent improvement in energy efficiency, which drove down actual energy use in 2016 by eight per cent compared to 2000.

## Decomposition of final energy use in the residential sector



Energy Efficiency 2017 Market Report Series, International Energy Agency (IEA)

Resulting from this, the total amount of primary energy saved in 2016 compared to 2000 was around 30 EJ in IEA member states and 23 EJ in other major emerging economies. Of these savings, 40 per cent resulted from reduced inputs to power generation. The 2016 fuel mix showed that coal, mostly in China, saw the largest savings, with IEA member countries seeing large savings in natural gas energy production – accounting for one third of savings.

Without the savings made in IEA member countries and other emerging economies since 2000 as a direct result of improved energy efficiency, global electricity use would have been 14 per cent higher in 2016. This has meant a reduction in greenhouse gas emissions of roughly four billion tonnes of carbon dioxide equivalent in 2016 alone.

# Legislating change

## Compliance drives efficiency

Legislating industry’s energy efficiency evolution starts at the top. The European Union’s (EU) 2012 Energy Efficiency Directive (EED) established a set of binding measures to help the EU reach its 20 per cent energy efficiency target by 2020. This was updated on 30 November 2016 following the European Commission’s proposal to include a new 30 per cent target.

The EED requires all EU countries to use energy more efficiently at all stages of the energy chain, from production to final consumption. This includes ensuring energy savings for both consumers and industry. Energy distributors in EU states must achieve 1.5 per cent energy savings per year via the implementation of energy efficiency measures and there should be initiatives implemented to empower energy consumers to better manage consumption.

For example, the EED suggests incentives for SMEs to undergo energy audits and support for large companies to help them interpret their energy audits and identify ways to reduce power consumption.

**“Every day we are paying more for energy than we should, due to poor insulation, inefficient lights, appliances, and heating and cooling equipment – money we could save by investing in energy efficiency.”**

Bernie Sanders, American politician





To implement EED effectively, each EU country has developed energy efficiency action plans to tackle region-specific challenges that could create barriers. In Austria, for example, the Energy Efficiency Act (EEffG) came into force in 2014. The Act states that the target of reducing final energy consumption to 1050 PJ by 2020, through energy efficiency initiatives is highly ambitious in view of expected economic and population growth.

One implementation affecting Austrian industry is the introduction of new taxes for electricity, natural gas and petroleum, all of which enforce higher tax rates than the EU Energy Tax directive (2003/96/EC). Increasing the cost of energy generated by fossil fuels is intended to encourage industry to adopt efficiency systems by putting pressure on their bottom line.

Equally, however, Austria is also incentivising the switch from fossil fuels with the Green Electricity Act, which provides feed-in tariffs for photovoltaic systems. For systems mounted on the side or on top of buildings, in addition to the feed-in tariff of 8.24 cent/kWh granted on application, there is an investment cost subsidy of 40 per cent,

up to a maximum of €375/kWp. Furthermore, subject to certain conditions, cogeneration plants are incentivised by means of investment cost subsidies.

France has taken the approach of establishing regulation and incentive by sector. In the industrial sector, France's energy efficiency policy is based on Directive 2003/87/EC, establishing a scheme for greenhouse gas emission allowance trading within industry. This is in addition to financial incentives, regulatory measures like mandatory energy audits, support for standardisation processes and support for the development of the most efficient technologies through the Investing for the Future Programme (*Programme d'Investissements d'Avenir*).

France also offers energy savings certificates, a national programme called PRO-SME that provides financial support of up to EUR 40,000 to businesses to set up energy management systems certified to ISO 50001 standard and a preferential tariff for electricity-intensive businesses that obtain the same certification.

The National Energy Efficiency Action Plan (NEEAP) 2017 for the Federal Republic of Germany was developed in conjunction with the country's 2020 Action Programme for Climate Protection. Germany's focus is heavily on encouraging and supporting regular energy audits to maintain systematic inspection and analysis of energy use and consumption in industrial businesses, with the aim of identifying potential for improvements.

The reason for this focus is to support businesses by highlighting the potential energy savings, aligning the need to comply with the EED and the need for industry to improve its bottom line. The energy audits must meet the requirements of DIN EN 16247-1 and the Federal Office for Economic Affairs and Export Control keeps a list of the accredited internal or external auditors who can perform the audits.

There are also new initiatives in Holland that are driving change.

*"In the Netherlands, the Government has instituted an obligation that states all industrial businesses must submit a plan demonstrating the new energy efficiency measures they plan to implement by July 2019," said Roy Schep, project engineer energy efficiency SMC Netherlands*

*"These must be initiatives or technologies that will provide a clear return on investment within the subsequent five years. This is a positive step that will help reduce carbon emissions in the region and help industry increase production."*

The legislative change in European countries not only supports the international initiatives outlined in the EED, it encourages adoption of energy efficient processes elsewhere.

*"The Italian market is more open to green movements," said Davide Lanotte, SMC Italia. "Outsider influence comes into play especially in Italy's exporter market. Many exporters ask for products to make processes 'greener' as markets like Germany are seeking products and partners compliant with environmental initiatives."*

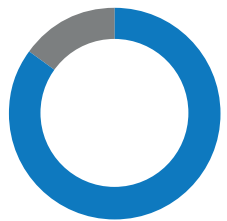




# Your guide to ISO 50001

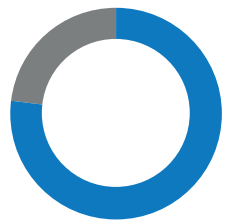
## Benefits of ISO 50001\*

\*According to the British Standards Institution (BSI)



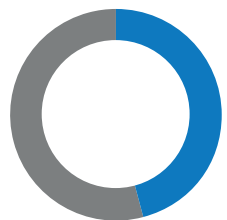
85%

regulatory and industry compliance



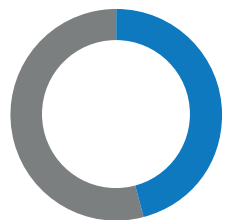
77%

reduced business cost



46%

waste reduction



46%

reduced business risk

## Maintaining standards

With so many national initiatives working towards these international carbon reduction objectives, how and why industry should invest in energy efficiency systems can be difficult to comprehend.

The why is quite simple. While there are environmental benefits to reducing energy use, the main impact on manufacturers is saving money. With growing energy prices, increased taxation on fossil fuels and financial incentives up for grabs, it makes sense to explore every possible avenue to reduce energy use.

*“While the drive to reduce carbon emissions is important, businesses obviously recognise the fact that a comprehensive energy efficiency system will save them money on energy usage,”* said Julien Caron, technical support manager SMC France.

The best way to approach the how, is to look to international standards that support best practice in a structured and viable manner. One of the most well-known and respected providers of global standards is the International Standardization Organization (ISO). As an independent, non-governmental organisation, ISO brings together the knowledge and expertise of its 162 national standards bodies to develop voluntary market-relevant international standards.

ISO 50001 was developed to support organisations in all sectors to use energy more efficiently through the development of an energy management system. It is intended to help businesses using various types of energy to identify realistic ways of reducing consumption, emissions and costs. The standard outlines energy management practices that not only save money today, but also in the long term – shielding the bottom line from the increasing cost of energy.

## ISO 50001 provides a framework of requirements for businesses to:



Develop policy for more efficient use of energy



Fix targets and objectives to meet the policy



Use data to make decisions about energy use



Measure results



Review how well the energy policy is working





### Terms and definitions

A list of all associated terminology to provide an understanding of key words and phrases for anyone implementing the standard.



### Scope

The definition of the coverage of the standard to achieve the intended outcomes of the resulting energy management system.



### Management responsibility

Top tier management must fully engage to support the energy management system, ensuring the necessary human, technology and financial resources are available.



### Energy policy

This will confirm commitment to energy performance and should reflect the size and nature of your business.



### Management review

Assessment of successes, failures and plan for the future of the energy management system.

## Key clauses of the standard



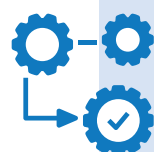
### Checking

Measurement and evaluation of the energy management system.



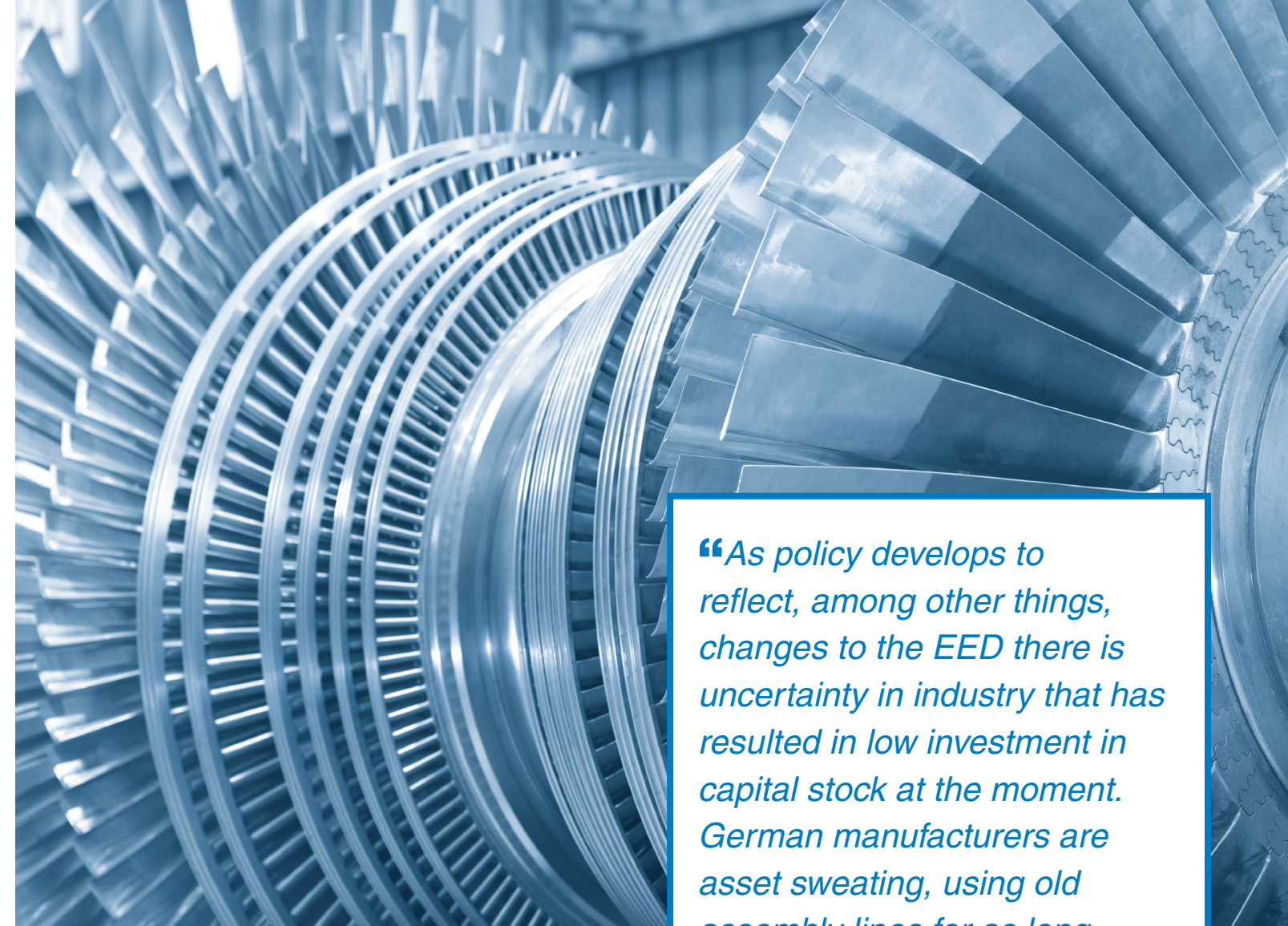
### Energy planning

The outline of how your business will organise itself to address energy use, covering what could affect energy and how to analyse and assess data to establish an energy baseline.



### Implantation and operation

Ensuring the training and support of the team, implementing the energy management system, undertaking ongoing review, documentation and the measurement of energy use.



*“As policy develops to reflect, among other things, changes to the EED there is uncertainty in industry that has resulted in low investment in capital stock at the moment. German manufacturers are asset sweating, using old assembly lines for as long as possible to get the most from the investment. There is also the fact that existing energy efficiency technology costs more than less efficient alternatives and the payback period is quite long.”*

Herr Neißer

### How is industry responding?

Changes in regulations and updated or new standards can be great things for businesses, but it can be stressful having to make changes to processes, technology and hardware. So, the question is, do businesses see the benefit of embracing energy efficiency, or is it just another regulatory burden?

Herr Philipp Neißer, senior manager of energy and climate policy at the Federation of Germany Industry (BDI), believes that there is generally a positive feeling about adopting energy efficiency systems.

*“As the mother organisation to other German industrial associations we have broad knowledge of the views of energy consumers in chemical, steel, paper and iron manufacturing,” said Herr Neißer. “We also work closely with manufacturers of equipment used by energy intensive companies as well as companies that build power plants. All these members of the BDI see energy efficiency really positively.”*

*“This is mostly due to the same issue faced by any energy consuming economy reliant on imported fuel sources; like most of the EU – it’s expensive. We are at a cost disadvantage, so energy efficiency has always been a priority for Germany, and this traditional strong focus gives us a comparative advantage in international trade. Energy will become more expensive in other geographies, so when climate policy hits other areas we will already be ahead.”*





Despite industry in Germany embracing efficiency, German Trade and Investment (GTAI) states that there is still a massive untapped potential for investment in energy efficient production processes and technology. According to Herr Neißer, there are several reasons for this, including uncertainty about policy.

With this uncertainty creating hesitation, what energy efficiency initiatives or regulations are truly supporting German industrial companies?

*“Directives that come out of Brussels at a European level and related initiatives are things that companies tend to engage with without needing any regulatory push, because there is a natural incentive to be more efficient and save money,”* said Herr Neißer.

*“The German Government recognises the fact that without energy efficiency measures we will never meet the carbon reductions required to meet environmental targets. To meet energy demand more effectively, the now global Efficiency First principle started in Germany and was launched with the EU Energy Union in 2015.”*

*“However, one of the most helpful initiatives in Germany has been the Energy Efficiency Network. Companies are incentivised to work together with suppliers in the network to address issues collaboratively. We need to fight asymmetries in information and understanding to share information throughout the value chain, so we can collaborate and be efficient together.”*

There is a similar drive to share knowledge and build a united approach to energy efficiency in the UK. Josh Dugdale, technology manager at the Manufacturing Technologies Association (MTA) explains how this is being handled in Britain.

*“The MTA represents a wide range of businesses that make manufacturing technology, and we run quarterly Technology Committee meetings for members to attend to keep up to speed with the latest legislation and machinery directives and to discuss proposed changes to standards. One of the key themes addressed by the 20 members that make up the Technology Committee recently has been energy efficiency. The meetings have driven discussions that are being used to fuel research and development into next generation technology.”*

Dugdale explained that British businesses know they need to embrace energy management systems to remain competitive – but not just to save money on energy costs. There is a need to produce efficient technology using efficient means to satisfy customer demand, and businesses in the region are having their say on how this happens at a legislative level.

*“The European Commission recently proposed the Eco Design Directive which was not well received by UK industry,”* said Dugdale. *“The directive set mandatory ecological requirements for energy-using and energy-related products sold in all member states, covering more than 40 product groups. However, it does not account for the fact that there are different types of machinery that cannot comply with this and still be effective.”*

*“Instead, UK industrial businesses, with the support of the MTA, are pushing for the adoption of ISO 4955-1. This is an eco-design standard that has just been updated to consider the latest technology.”*

While German businesses are gun-shy about making large capital investment to improve energy efficiency systems, the UK is making the most of technology resulting from the Industry 4.0 shake up.

*“People are adopting Industry 4.0 to be more efficient,”* said Dugdale. *“We have always been able to collect data, but now we have the tools to analyse it properly to start and make smart decisions. The UK is also waking up to the fact that you can embrace Industry 4.0 without breaking the bank, by heavily investing in totally new machinery. You can make incremental adjustments to gather data from something that is 60 years old and get it up to modern standards.”*



# Getting help

The MTA does more than just bring industry together and monitor the market. The organisation also sits on panels and select committees at EU and UK Government levels to reflect the views of its members and demonstrate how technology works and needs to advance.

There are trade associations like this in most countries, such as the Federation of Associations of Industrial Engineers in Spain (*Federación de Asociaciones de Ingenieros Industriales de España*) and Confindustria in Italy, which ensure the voice of industry is heard. This not only supports the development of policy that is truly reflective of current needs, but creates an environment within which needed technology can be developed and commercialised.

While this is indeed useful, it doesn't really help manufacturers with boots on the ground attempting to establish the best energy efficiency system for their needs. It can be tricky to know where to start. Luckily, there is plenty of help at hand.

*“Manufacturing is more than just putting parts together. It's coming up with ideas, testing principles and perfecting the engineering as well as final assembly.”*

James Dyson, British inventor, industrial design engineer and founder of the Dyson company.



One of the best places to begin is looking to regional and international trade associations for suitable resources on the topic of energy efficiency. The International Energy Agency is a good example. Not only is its Energy Efficiency 2017 report a great resource to prove the business case for investing in technology, the organisation also provides industry and region-specific reports, data, technology updates and insights into the future.

When you're ready to implement the advice in these resources, it's a good time to approach an organisation that can help you prepare for and implement an energy efficiency standard like ISO 50001. The ISO website has a complete list of membership bodies that you can approach in your region for help.

For example, in the UK there is the British Standards Institution (BSI) and in Spain there is UNE. Both offer support selecting the best standards for your business and will guide you through the ways that your business processes and practices need to adapt to be compliant and save energy.



## Go the extra mile

To really get the most out of the process you should also make sure your business is not missing out on any regional subsidies or incentives and you should explore voluntary schemes that will get the most out of your energy efficiency system.

This won't just help you comply with standard and regulations, it will ensure you save as much as possible on energy costs — and even make money.

The Carbon Trust runs an Industrial Energy Efficiency Accelerator (IEEA) in the UK that is funded by the Department for Business, Energy and Industrial Strategy (BEIS). The IEEA is a funding programme designed to support partnerships between developers of energy efficient technologies and companies that are willing to test these technologies on-site.

This not only allows innovators to bring new products to market, it also means that companies willing to test the technology get the chance to implement pioneering techniques with reduced risk and capital cost.

In Italy, incentives are geared to allow businesses that implement energy efficient projects to sell the energy they saved in the form of white certificates, awarded by the state for saving pre-defined levels of energy. This has enabled many businesses to enjoy significant return on investment for their energy efficiency system.

One of the most important resources that will make your system as effective as possible, whatever incentive or initiative you are part of, is your own supply chain. Any provider of components, machines and software worth their salt is developing or already offering a range of products that have efficiency at their core. This means they have gone through the pain of market and product research and standard compliance. So, why wouldn't you ask for their insight?

At SMC, for example, we have invested a great deal of time and money in developing a rounded energy efficient solution for our customers that goes far beyond efficient hardware products. In the process of developing this service offering, we have built an extensive knowledge of various energy efficient practices and techniques that can transform energy into a boost to our customers' competitiveness.

*“We not only work closely with our customers, we also collaborate with third parties for comprehensive energy assessments, to keep up with the latest standards and help manufacturers understand what opportunities are available for them,”* said Davide Lanotte, SMC Italia.

This means we have the assessments or audits in many regions to establish a baseline to work from and highlight areas to improve efficiency as well as offering the technical support customers need to work towards green procurement. Any supplier helping you build an energy management system should be in a similar position to not only offer what you physically need to be successful, but also share knowledge and experience too.

## Let's get practical



With all the clear benefits of embarking on an energy efficiency journey, it's important to get the best out of the process by tackling the practicalities of upgrading machinery, adopting new technology and establishing measurement and evaluation tools in an orderly way.

Many believe that this involves a costly overhaul of all legacy machines and systems. However, this is simply not the case. Massive efficiency gains and cost saving can be achieved by making incremental improvements to your existing equipment, especially if you work with a supplier like SMC that

has the widest range of energy efficient products on the market. The thing to consider is the plan for how and when you will make these changes.

Measurement is knowledge, so the most important aspect of any SMC energy efficiency are the tools to measure and analyse what energy is being used, where energy may be wasted and where improvements are working. This empowers organisations to make smart choices from the outset and maintain informed decision making based on quality analysis through all energy efficiency cornerstones.

*“A pound invested in energy efficiency buys seven times more energy solution than a pound invested in nuclear power.”*

Zac Goldsmith, British politician and journalist.





## Generate just what you need

Any manufacturer knows it makes no sense to be indiscriminate with your source materials and generate high volumes of waste. You order precise amounts and optimise processes to use as much of that material as possible. The same principle can be applied to the energy generated to power your processes.

Generating just what you need is by no means simple, but it is the first step to efficient use. Oversupply is not something that you can spot easily but, in our experience, when you apply the right measures you can set your baseline energy supply to the right levels and adjust accordingly.

Using compressed air as an energy source is a prime example of this and offers the most saving potential. The electrical energy required to manufacture compressed air across European industry accounts for around 20 per cent of total industrial consumption, and with a small amount of inversion SMC can generate high savings in short period of amortisation.

In the average facility, 50 per cent of the generated compressed air is used in air blowing applications, 20 per cent for actuation and 15 per cent is lost through leakage. This last point is something that many plant managers are not aware of because they are not measuring air being used in processes or how much is being lost, something a partner such as SMC can help solve.

*“Completely eliminating air leakages is impossible. However, that doesn’t mean there is nothing you can do,”* said Roy Schep, SMC Netherlands.

Assessment of the compressed air going into existing process to measure air consumption, pressure and pressure dewpoint is the best start point to establish where we have an oversupply of energy.

This data, which can be collated in easy to use apps or dashboards, informs a comprehensive plan of what tools should be put in place to minimise waste and continue effective monitoring. For example, one of the quickest and most effective ways to reduce the amount of generated energy is to reduce the pressure of airline using pressure regulators.



SMC has developed a range of audit and assessment options to ideally suit the various types of businesses it works with across Europe. Each European region has a dedicated team of energy efficiency specialists that can apply their knowledge to the unique challenges and requirements of every manufacturer they work with.

*“This focused expertise SMC is able to offer ensures highly accurate results any audit process. We afford customers the opportunity to approach energy efficiency in a way that best suits their business,”* said Julien Caron, SMC France.

The importance of information gathering and providing businesses with all appropriate data to make informed investments is highlighted in the collaborative nature of how SMC works with its customers. Spending time on site with plant managers and engineers allows our specialist to adapt services and recommend the best products to answer challenges such as limited space as well as outline a plan for incremental improvements to suit any budget.

This close relationship and clear analysis of energy use results in energy efficiency systems that work, with quick and demonstrable results in the form of cost savings. However, it’s not just accuracy of audits and our expertise that generate these results – it’s SMC’s range of suitable products.

*“Manufacturers often struggle to source efficient options from our competitors, but it’s easy to find the best solution for your businesses with SMC,”* said Julien Caron, SMC France.

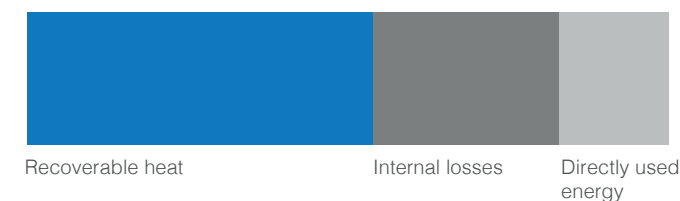


## Recover what you generate

Recycling energy during the production process is a great way to save on energy costs. The biggest recovery potential is usually at the generation source because energy transformation generates heat – another energy source. This heat can simply be reused for another operation like warming water via a heat exchanger or heating the facility with hot air distribution.

In fact, when you look at the usable energy generated in one compressor’s electric motor, you can see that it is a relatively small amount compared to the energy produced in heat or lost completely in internal losses.

### Energy transformation process - outputs



Heat recovery as a concept isn’t completely revolutionary, but what about air? Heavy air consuming applications, like polyethylene terephthalate (PET) manufacturing, can actually deliver free energy to other compressed air systems. A pilot operated two port solenoid valve can allow high pressure applications to feed lower pressure processes.

We have also developed an actuation circuit using our range of check valves and flow controllers to use the released air to perform the return stroke in each cycle. This system has been proven to reduce air consumption by 40 per cent, leading to considerable cost savings for applications that rely on large cylinders or cylinders with a high working frequency.

However, to really take control of air consumption it is important to consider a holistic approach instead of simply focusing on individual pieces of machinery.

The path to energy efficiency isn’t a straight line. With analysis of a whole production line, instead of piecemeal analysis of individual machines, you can clearly see where to best recover energy and plan effectively.





## Monitor your consumption

We're entering a new age of data. We've been collecting data for a long time, but one of the main benefits the Industry 4.0 movement is the visualisation of this to analyse it in a way that offers actionable insight to make informed decisions.

Naturally, the first step in monitoring your energy consumption and assessing where to make efficiency improvements is to gather the right data to begin with. You must ensure that the data gathered shows your overall energy usage patterns, such as which machines consume the most energy and how your consumption fluctuates over time.

It's also important to consider employing tools like remote monitoring, centralisation and big data management that share information with as many people on your team as possible, to motivate them to help save costs. Monitoring this way also reveals what is hidden. Without looking at every facet of your operation, how can you know if something is going wrong and costing you money?

Simple changes like adding switches to machines and installing leak detection systems go a long way to help with this. For example, our digital flow switches are an out-of-the-box solution that is easy to install and allows you to improve the productivity, performance and efficiency of machinery.

Of course, new technology doesn't come without its challenges. Changes to processes can be difficult to implement, especially if there is a digital skills gap. Organisations can be reluctant to embrace new systems if it poses risk by changing processes employees are used to. To counter this, SMC has developed all products and software with ease of use in mind.

For example, easy to connect products such as pressure switches or flowmeters enabled with the technology to record and share data that can be easily viewed. The software is straightforward and there is no need for additional training for employees to use it.

***“Measurement is an important tool we offer our customer. Meaningful change cannot be achieved if you don't first understand the data,” said Roy Schep, SMC Netherlands.***

Not only is SMC technology easy to use, the products themselves are simple to understand. Automatic leak detection system (ALDS), for example, is such a self-explanatory and obvious addition to any factory floor that many of our customers are surprised that they haven't thought to introduce one sooner.

The ALDS is composed of a flow switch and a solenoid valve that allows it to operate efficiently without interfering with the daily running of machinery. Instead of using excess energy itself, the ALDS is only activated when needed to conduct cycle tests on machinery. It pushes air through the system to move a cylinder and if there is any excess air remaining this proves there is a leak. The flow switches in these devices are small and precise as the nature of the tests do not require the measurement of large volumes of air.

The data from these tests allows intrinsic data to be tracked daily for analysis, supporting predictive maintenance. This is another vital tool in the energy efficiency tool-box. Machines that are not performing to optimum levels use more energy to keep up with production — undermining any efficiency processes in place. Predictive maintenance lets plant managers react to potential issues before a problem occurs, keeping everything running smoothly.



## Use only the essential

Air may be free but compressed air is not. It's a common misunderstanding that the amount of wasted air is inconsequential because air is not an energy source and it is not costing you money. Not only is it a very expensive source of waste, machines that are leaking air or not using it as efficiently as possible, need to use more electricity than usual to function effectively.

Although optimising compressed air systems in machinery is best addressed by the original equipment manufacturer at the design stage, that doesn't mean you have to retire your inefficient, older machine and fork out massive capital investment on an entirely new one.

In the past, energy efficiency may have taken a backseat in machine design to favour high productivity output. However, there is too much pressure now to ignore efficient energy use. There are several types, sizes and variations of cylinders, valves and other automation components that can help efficiency.

When you are replacing components in machines during routine maintenance, it is the ideal time to build in more efficiency by selecting new components like those that minimise tubing lengths and diameters, or simplify the construction between components.

Another good step to take is to automate as much as possible, so that machines can respond to changes in conditions without delay, saving time, energy and money. For example, installing a thermo-chiller next to the machine will adapt refrigeration levels to demand in real-time, avoiding energy surplus.

Another automated product is the standby valve. This is a tool SMC created specifically to support plants losing compressed air when production is stopped. When machines are not in use the compressed air must remain on to keep the system pressurised. The standby valve tricks the system by keeping it pressurised but lowering the pressure enough that the shock on the system starting back up after shutdown is lessened. It is a very simple piece of equipment that can be installed on any machine.



## Think efficient

When you have aligned all the components of your energy efficiency system it is important to come full circle. It is not enough to simply install new components and tick boxes in a standard to call yourself energy efficient. To truly maximise your return on investment for all of this hard work, you need to treat the whole process as a continuum — it never ends.

*“If you are setting out on a journey you want to know how many miles you can travel with the tank of fuel in your car,” said Roy Schep, SMC Netherlands. “The same applies to compressed air and energy in your factory.”*

Ongoing knowledge of how much energy being used or wasted is incredibly important — and this knowledge must be shared. To support manufacturers in building an energy efficiency ethos across the whole business, SMC developed training programmes to ensure that everyone is aware of the possibilities decreasing the total air consumption creates in terms of monetary gains and standard compliance. Getting everyone onboard this what ensures the ongoing success of any energy efficiency system.

You need to consistently evaluate the success of your systems, adapt to changes in your production processes and evaluate new technology. If global industry can change its mindset to think efficient as part of normal practice, achieving the necessary carbon reduction goals set out by the UN Paris accord to protect the environment will be a happy by-product of efficient, and profitable, business practices.



# Bringing it all together

## 1. Understand regional legislation, regulation and incentives

Don't fall at the first hurdle and risk fines from not complying with regulations or missing out on financial incentives for embarking on your energy efficiency journey.

## 2. Conduct a thorough audit

Know where you stand before you begin so you can plan improvements to meet your specific needs – don't forget you can get help with this from a company like SMC.

## 3. Adhere to a suitable standard

By implementing a standard like ISO 50001 you will have the incentive and support to maintain your energy efficient practices effectively.

## 4. Don't go it alone

Make sure you get help. Join trade associations, read reports, embrace training on offer from reputable sources. You are not expected to know everything.

## 5. Assess your technology

This does not mean massive capital investment in new machinery. Based on your audit, plan incremental upgrades to existing machine to optimise efficiency and reduce waste.

*“With all the clear benefits of embarking on an energy efficiency journey, its important to get the best out of the process by tackling the practicalities of upgrading machinery, adopting new technology and establishing measurement and evaluation tools in an orderly way.”*





Expertise – Passion – Automation