

The image features a background of a palm leaf with a radial pattern of veins, transitioning from a dark red on the left to a bright green on the right. In the top left corner, the Siemens logo is displayed in teal text on a white rectangular background, with a white horizontal bar below it.

SIEMENS

Energy saving technology to deliver the fastest returns

Top 10 energy saving options

How can you increase efficiency, reduce costs and cut your carbon emissions?

Unstable energy prices, increased costs, regulatory demands and carbon reduction targets all add up to increased pressure for UK businesses. Together these demands are squeezing margins, reducing profits and, ultimately, having a negative impact on shareholder value.

One of the easiest ways to reduce costs in any organisation is better energy management. Using best practice methodology, we've developed energy plans that have helped many companies to reduce their costs, lower emissions, improve their profitability and enhance shareholder value.

Our energy saving solutions mean:

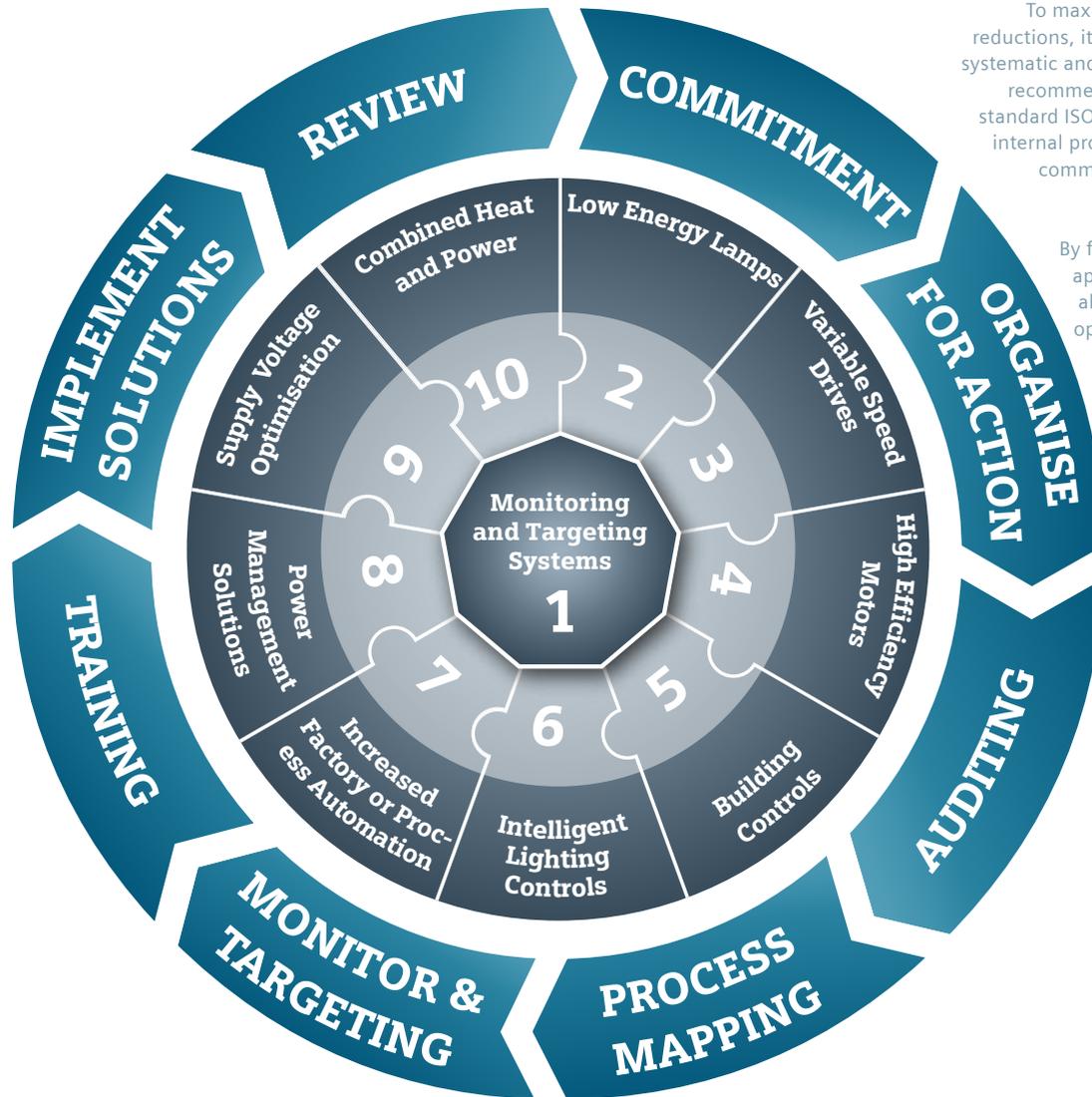
- Dramatically reduced energy and utility costs – typically 10% to 30%
- Simplified regulatory compliance
- Waste minimisation and process improvements
- A reduced carbon footprint
- Enhanced company reputation and increased brand value

Our focus is on developing solutions which maximise reductions in operating costs without placing unacceptable strain on capital expenditure:

- Professional energy and utility audits
- Direct energy saving products
- Measuring and monitoring tools
- Management and control solutions
- Innovative financing programmes and business planning

Whilst a systematic energy audit should be deployed to determine the site specific priorities, this guide highlights examples of energy saving technologies that commonly deliver the quickest financial payback.

Energy Management – a systematic approach



To maximise energy and cost reductions, it's essential to adopt a systematic and holistic approach, as recommended by international standard ISO 50001. This includes internal processes, management commitment and employee engagement.

By following a systematic approach you'll uncover all major energy saving opportunities as well as low-cost or no-cost energy saving options.



Combined Heat and Power

When it comes to energy efficiency, combined heat and power (CHP) plays an important role: CHP plants achieve a significantly greater degree of energy efficiency, compared to conventional methods, by generating electricity and heat simultaneously.

CHP schemes can realise good returns on investment, especially when maximum use is made of the heat generated.

Ideally, the demand for heat is first reduced, and then the CHP scheme is sized to meet the new heat load. In some schemes, overall efficiency is further improved by 'tri-

generation' – using additional absorption chillers to convert waste heat into cooling.

CHP equipment can also improve reliability of the electrical supply and reduce carbon emissions, and can be run to maximise benefits from tariff structures.

Systems are available to address a wide range of requirements, from large industrial applications through to small scale units.



Supply Voltage Optimisation

Most modern equipment is designed to operate at the standard European voltages of 400V/230V. However, most facilities in the UK suffer from persistent over-voltages of typically 420V/242V or worse. This results in reduced efficiency, equipment failure and increased maintenance.

Optimising your supply voltage to 225V or 220V can save between 5% and 15% in electricity consumption, depending on the equipment being powered. To arrive at an accurate savings figure, we recommend undertaking an expert assessment that takes into account any planned energy efficiency equipment upgrades.

Because the optimisation units are connected in series with the main supply transformers, installation is usually quick and the benefits can be realised across the whole site's electrical supply.

There may also be lower, but still valuable, benefits to be achieved by low-cost and no-cost improvements, such as tapping down transformers. Alternatively, replacing older transformers will also deliver significant dividends.



Power Management Solutions

By using intelligent power management systems and load management equipment you can take advantage of lower tariff structures and incentive payments. As well as delivering substantial savings, power management solutions can also reduce maintenance and enhance the lifetime of equipment.

Intelligent load management and utilising of on-site generation can be used to provide a dynamic, real-time response to energy demand, which means a precise matching of load with tariff structure and therefore better management of costs.

Improving the site's power factor to above the recognised benchmark of 0.95 can also reduce costs, improve efficiency

and maximise the available capacity of the local power distribution system.

Modern electronic equipment distorts the local power supply and can therefore damage or reduce the life of equipment, cause tripping, or result in extra losses. Controlling this with active harmonic compensation will increase efficiency, improve equipment reliability and extend asset lifetime.

We can help ensure that your facilities comply with UK regulations such as ER G5/4-1. For example, a seven-day power system survey can assess the status of harmonic distortion, power factor and regulatory compliance, and identify the feasibility of voltage optimisation.



Increased Factory or Process Automation

Up to 80% of potential savings in a plant come from improved automation. Done correctly, automation can increase productivity, reduce downtime and minimise maintenance requirements – whilst simultaneously cutting energy consumption and reducing carbon emissions.

All branches of industry and commerce can benefit from optimised automation systems. These can also be used as the backbone for data collection for the metering and instrumentation required for the energy management system. Integrating specialist energy management functions into the automation system is the most effective

way to implement an automatic monitoring and targeting system (aM&T).

Combining an enhanced control scheme, the appropriate metering and instrumentation solution together with advanced software tools ensures that system not only delivers the optimum plant or process performance, but also provides real time reporting on all the key performance indicators (KPIs) and high level management information reports. Undertaking a detailed energy / operational efficiency analysis is the ideal first step when identifying the optimum automation solution.

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Intelligent Lighting Controls

By installing intelligent lighting systems you can save over 40% of the energy used in lighting.

Light fittings can be individually controlled to turn off or to dim the output as required. Used in conjunction with light level sensors and presence detection, controls can be optimised to take full advantage of natural daylight savings and maximise off periods. Further major savings come from reduced maintenance, which is also more easily scheduled with predictive failure analysis.

Once installed, lighting controls provide excellent flexibility and an improved user environment as the light conditions are optimised at all times. With individual

control of fittings, it is very easy to reconfigure lights into different groups for new office layouts or other required changes.

We have a number of different lighting control solutions to suit different site requirements. Integrating your lighting controls into an overall building energy management system will give you further control and information.



Building Controls

Of all the energy consumed in the UK, 40% is used by buildings. By deploying effective building controls, you can typically reduce consumption by up to 30%.

Substantial savings also often result from an expert review of existing building controls, which may have been incorrectly commissioned or poorly maintained. The three basic functions of a Building Energy Management System (BEMS) are improving plant control, monitoring and displaying energy consumption, and optimising equipment operating schedules.

They can also provide a comfortable working environment for building occupants and help ensure compliance with current energy legislation.

Building owners are looking for greater interaction between the different services in their premises such as HVAC, fire, security, lighting, etc. Many customer benefits including significant energy savings can be achieved with a truly integrated BEMS.

BEMS are fully scalable and can be used in all types of commercial and public sector buildings, from small to large. The EN15232 standard divides BEMS in four efficiency classes from A to D, with A providing the best energy efficient operation. Class A systems use cross system communication along with demand dependant control to ensure maximum savings. Our systems can ensure class A operation

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High Efficiency Motors

Worldwide, 20 million industrial motors consume 65% of industrial electricity.

A single 75kW motor may use over £1 million worth of electricity in its lifetime, typically more than a hundred times the purchase price. To look at it another way, the energy cost of running a motor for two months can be greater than the purchase price. It therefore makes very good sense to invest in high efficiency motors.

Modern motors which meet the new mandatory motor efficiency standards IE2 are substantially more efficient than older versions, paying back their purchase price within a few months. If you employ an effective drive train

management policy which includes motors, variable speed drives, gearboxes and the driven machine, then you can release further savings.

A motor audit will reveal data on your installed assets and help determine whether to replace immediately, upgrade on failure, or opt for a rewind policy. Many organisations now routinely replace failed motors rated up to at least 75kW with high efficiency models.

For larger power ratings or critical applications, additional benefits can be achieved using expert systems and enhanced condition monitoring.



Variable Speed Drives

Variable Speed Drives (VSDs) optimise the voltage and frequency supply to the motor to match the speed to the actual load demand, thereby significantly reducing energy consumption.

In the United Kingdom alone about one million pounds sterling in unnecessary electricity costs are incurred every day because the appropriate systems are not equipped with variable speed drives.

Correctly designed VSD systems typically reduce energy consumption by 20% to 70%, depending on the application. The most receptive applications tend to be pumps, fans and centrifugal compressors although

worthwhile savings may even be achieved on more demanding applications such as mixers, centrifuges, reciprocating compressors and extruders.

In addition to providing substantial energy reduction, other VSD benefits include soft start-up of the equipment, reduced current on starting, reduced mechanical stress and high power factor.

VSDs are intelligent devices that can easily be integrated into energy management systems, and may also be a key component in dynamic power management by helping with tariff management and demand reduction.



Low energy lamps

Lighting consumes nearly one-fifth of all electricity produced. In commercial buildings, it accounts for around 30% of total energy usage and although in industry the percentage is lower, it remains a significant part of electricity consumption. The payback times from low energy lamps are short – typically a few months – and changes can be quick and easy to implement.

Huge investment in research and development by organisations such as OSRAM means that many applications – including high bay lighting, external lighting and street lighting – can now benefit from low energy technologies. And, because of the extended lamp

life available with modern low energy lamps, considerable savings in maintenance can also be achieved.

A comprehensive lighting audit can identify the optimum lamp and fitting configurations as well as energy and carbon reductions. By deploying efficient lamp technologies such as LEDs, CFL and energy-saving halogen lighting, savings of up to 80% are possible compared with traditional lamp technology.

You can also reduce your energy consumption still further by using intelligent lighting controls and implementing schemes such as presence control, daylight harvesting and constant light controls.



Monitoring and Targeting Systems

An effective monitoring and targeting system is typically the most important element of any energy management programme and will deliver the fastest payback.

The ability to measure and monitor real time key performance indicators on your site, by collecting the right data in the right way, will mean you can highlight problem areas and identify quick payback opportunities. More than just a metering system – which won't in itself save you money – an effective monitoring and targeting system includes the right software systems and reporting tools. Typically, it will show that 3% to 10% of the entire utility spend can be eliminated using low cost solutions.

Ideally, the monitoring and targeting system will collect data through the automation system or building control system. If this is not possible, a separate energy management system can be easily implemented.

The system should collect data from all the major loads to provide the required degree of visibility and will include electricity, gas, water, steam, heat, coolness, fuel oil or other parameters as appropriate.

A further advantage of a monitoring and targeting system is that it provides the information to validate the savings from major capital investment projects.

How we can help?

Energy management is a broad area. Whatever your level of experience, an independent review can help show where you could make more savings.

Siemens is the largest independent provider of energy services in the UK. Customers of our energy management solutions include Premier Foods, Diageo, Mars, J Sainsbury, McDonald's and Royal Mail.

With access to the largest portfolio of sustainable technology solutions in the world, we're ideally positioned to help you maximise energy, cost and carbon reductions. We don't simply look for opportunities to supply our own products and technology; our primary goal is to identify all energy saving opportunities for our customers.

This guide highlights the energy saving investments that typically deliver the fastest returns and estimates their

expected payback periods. However, every customer's situation is different. To establish your own specific 'top 10' priorities, the best starting point is a Siemens independent energy audit that will identify the costs and benefits of every potential energy saving project at your site.

We can then help implement the tools, automation and software to measure and monitor what's happening on your site, and manage the installation of products and solutions that will deliver the energy savings. Our expertise in system design, installation, commissioning and maintenance will eliminate any practical problems in the solution delivery and minimise lifecycle costs.

For more information:

Email: info.industry.gb@siemens.com

The top 10 energy saving investments that typically deliver the fastest returns:

| | PAYBACK |
|--|--------------------|
| 1. Monitoring and Targeting Systems | 1-3 months |
| 2. Low Energy Lamps | 1-12 months |
| 3. Variable Speed Drives | 3-12 months |
| 4. High Efficiency Motors | 3-12 months |
| 5. Building Controls | 3 months - 4 years |
| 6. Intelligent Lighting Controls | 1-4 years |
| 7. Increased Factory or Process Automation | 1-4 years |
| 8. Power Management Solutions | 1-4 years |
| 9. Supply Voltage Optimisation | 2-5 years |
| 10. Combined Heat and Power | 2-7 years |

As well as these top 10 solutions, a wide range of other options includes:

- Behaviour change, training and employee engagement programmes
- Design, commissioning and maintenance
- Renewables and low carbon technologies
- Waste minimisation
- Emissions monitoring
- Effluent and water treatment
- Energy from waste
 - Anaerobic digestion
 - Pyrolysis
 - Incineration
- Carbon footprinting
- Water technologies
- Low carbon transportation and low emission zones

Innovative financial solutions

By taking advantage of our financial solutions, you can put in place energy saving solutions without any upfront capital investment. We work with customers to identify their key financial drivers and evaluation criteria. Using this information we can improve return on investment and internal rates of return, which customer often require to achieve capital or revenue expenditure budgets.

Financing is structured such that any investment capital or expenditure is offset against reductions in utility bills. For larger programmes we can help manage expenditure for the whole project aligning all of the associated costs with energy savings.

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